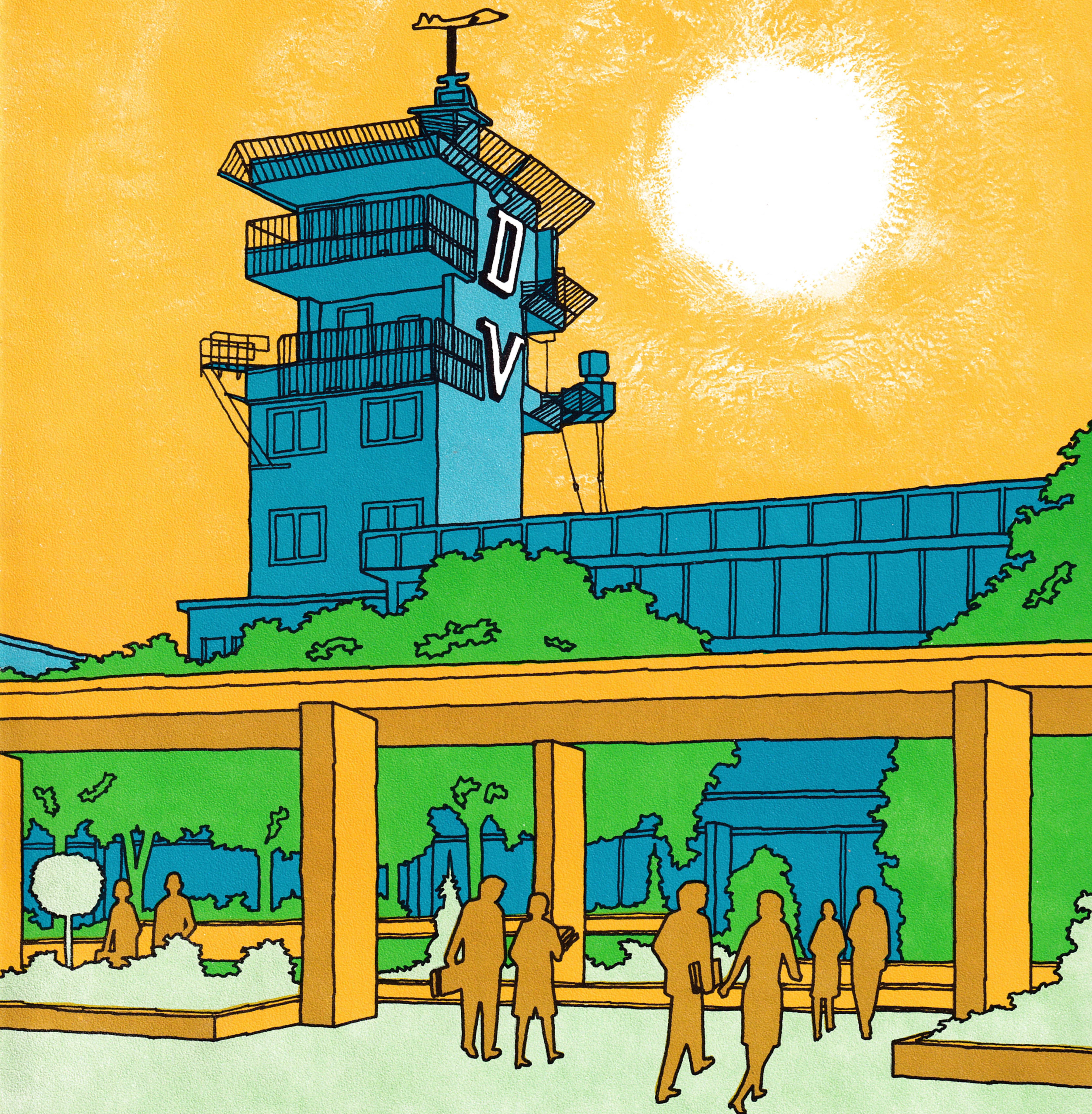


# rendezvous

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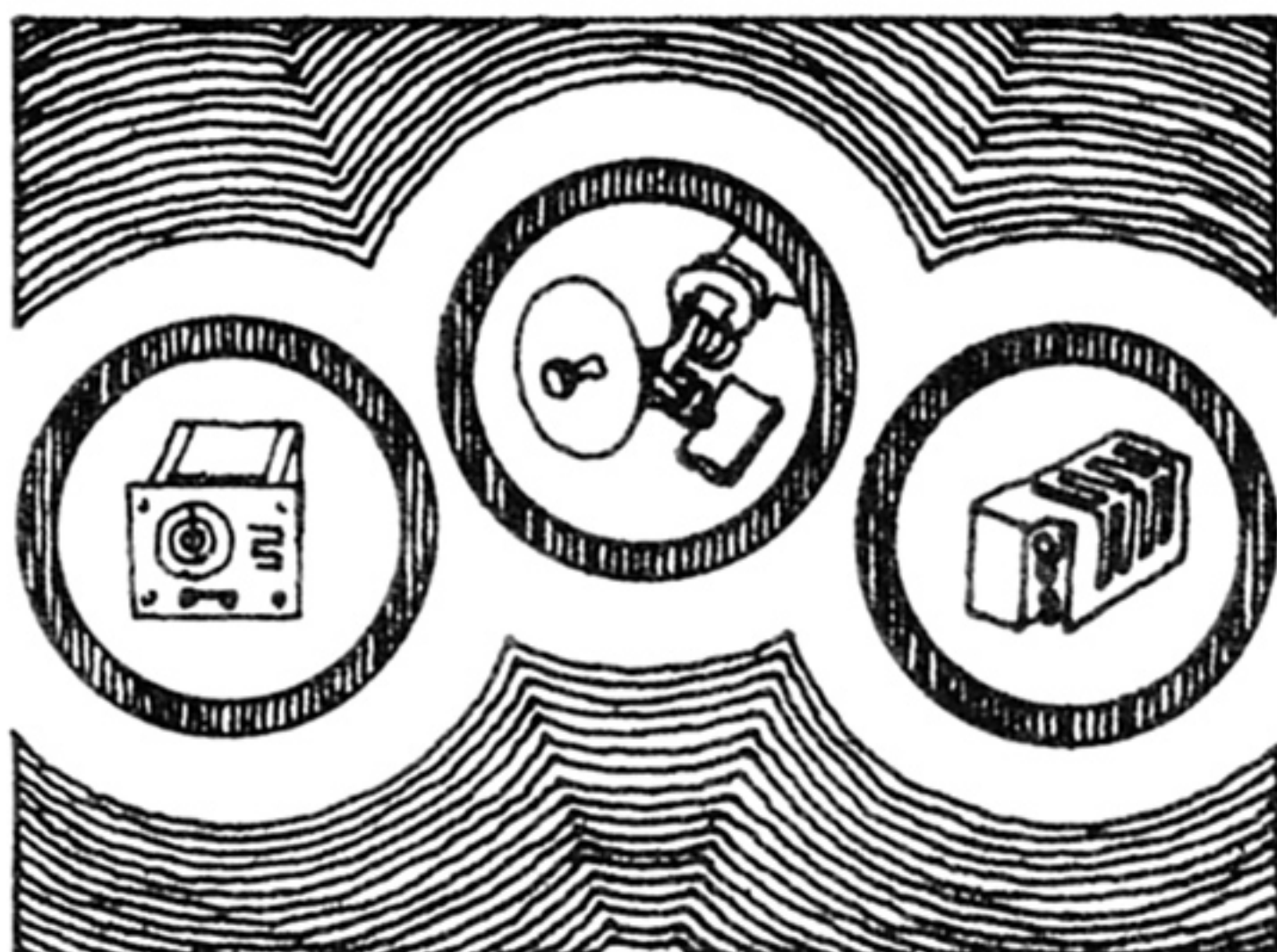
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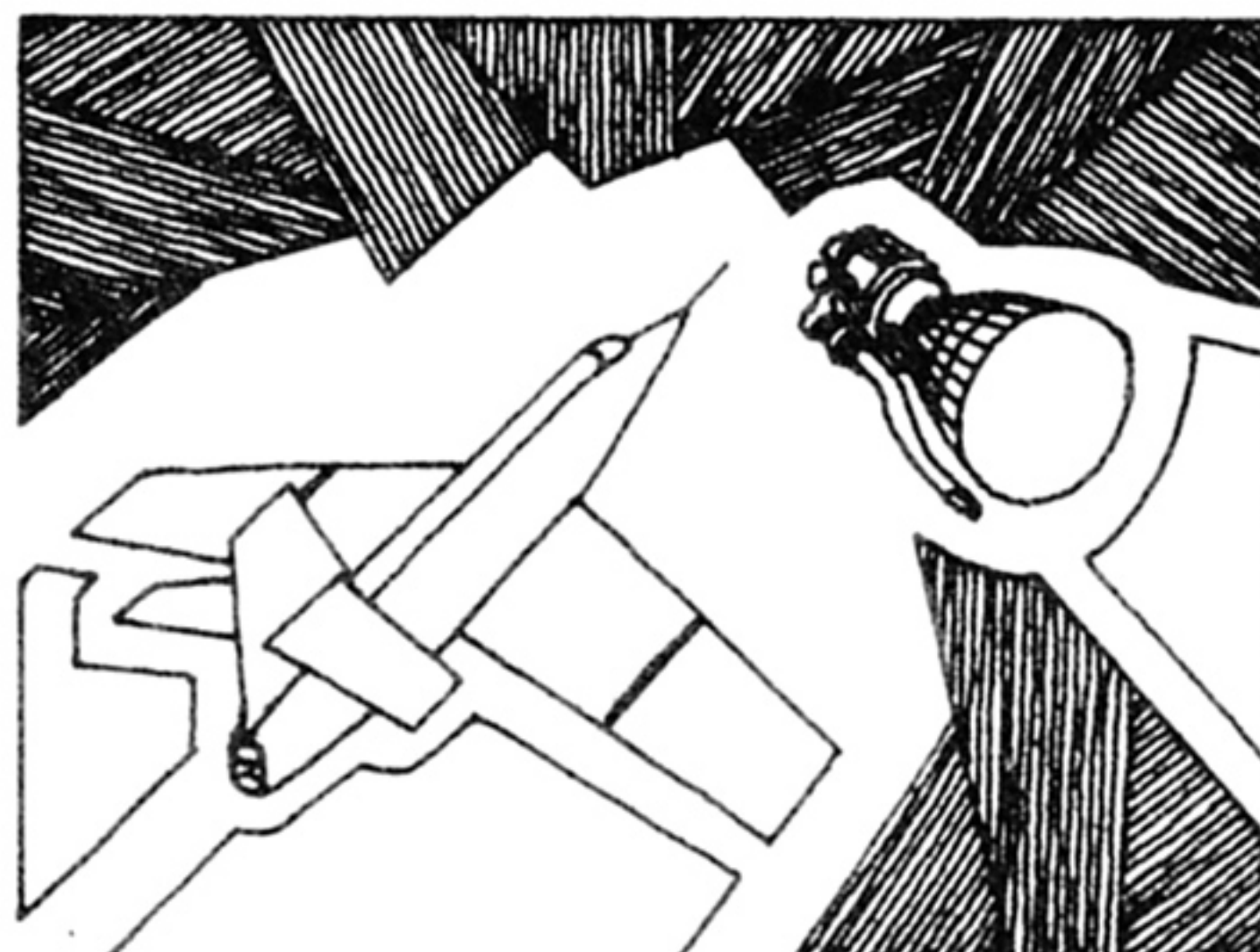


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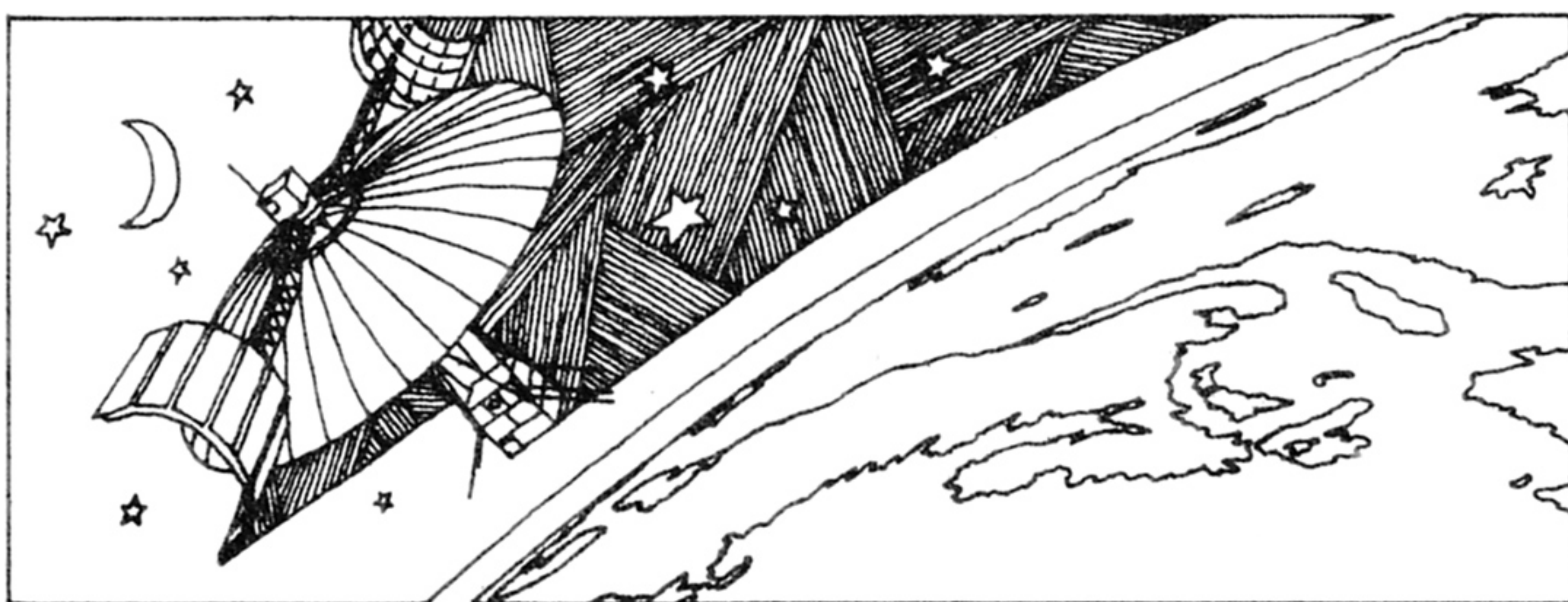
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TECHNICAL PRODUCTS

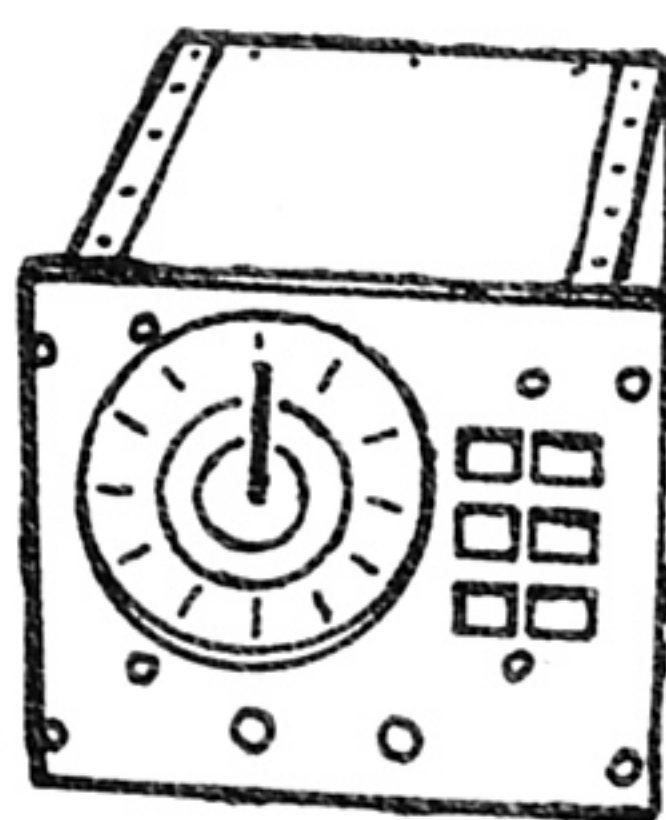
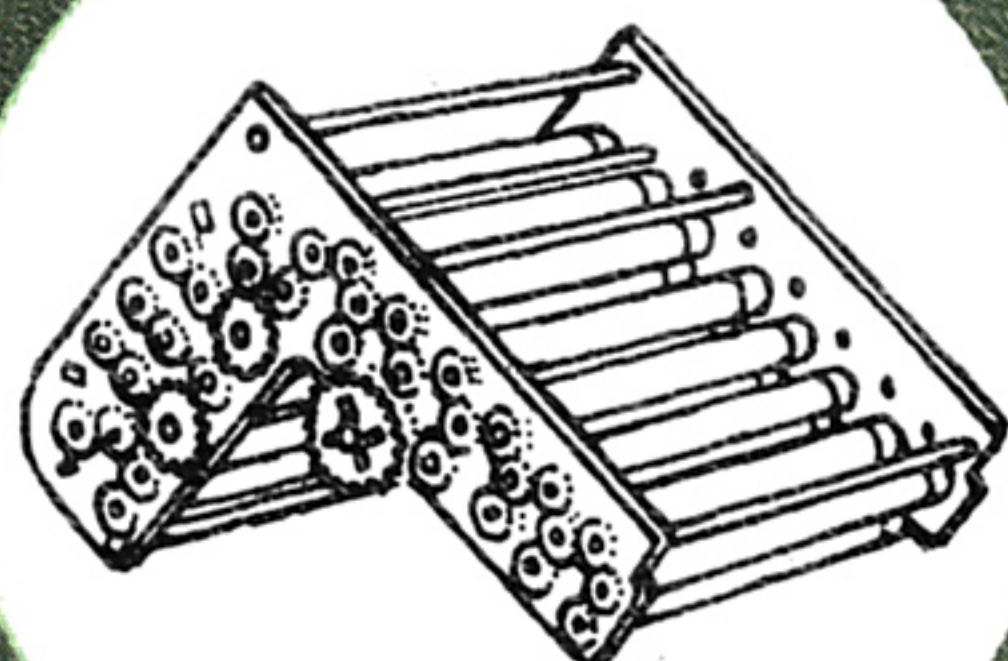
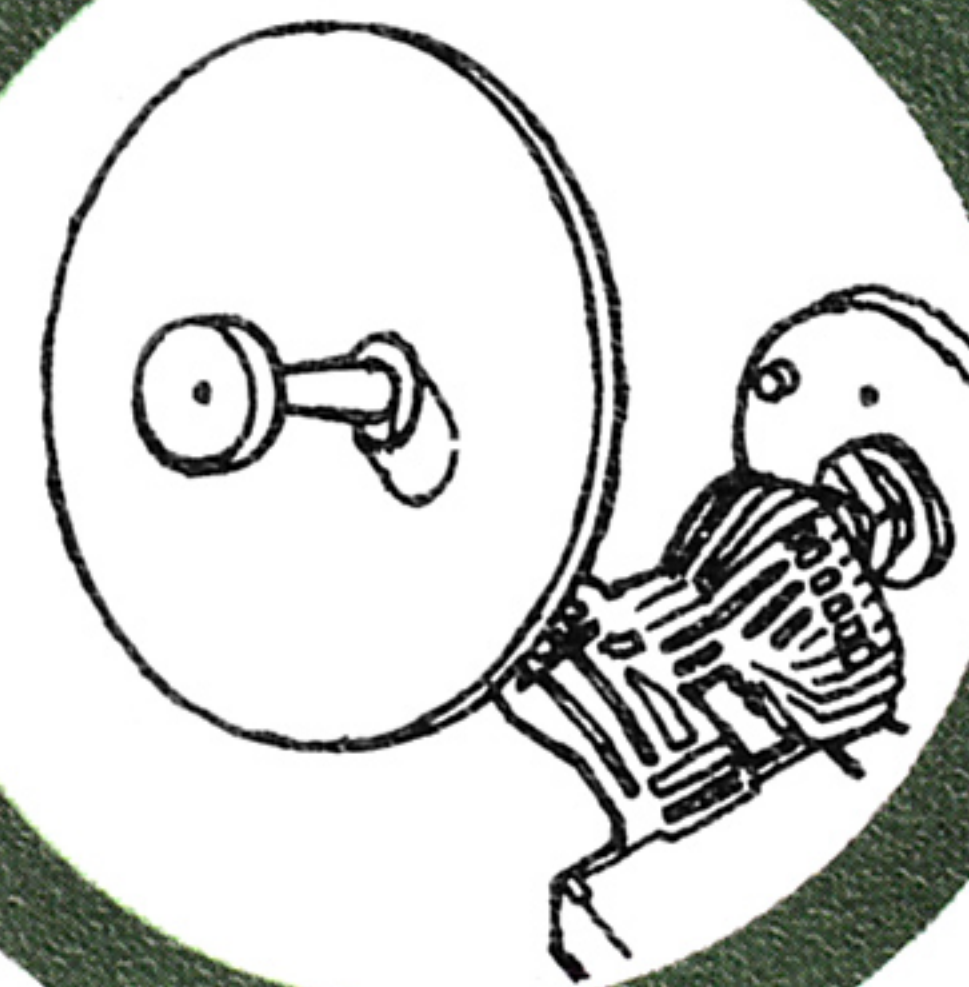
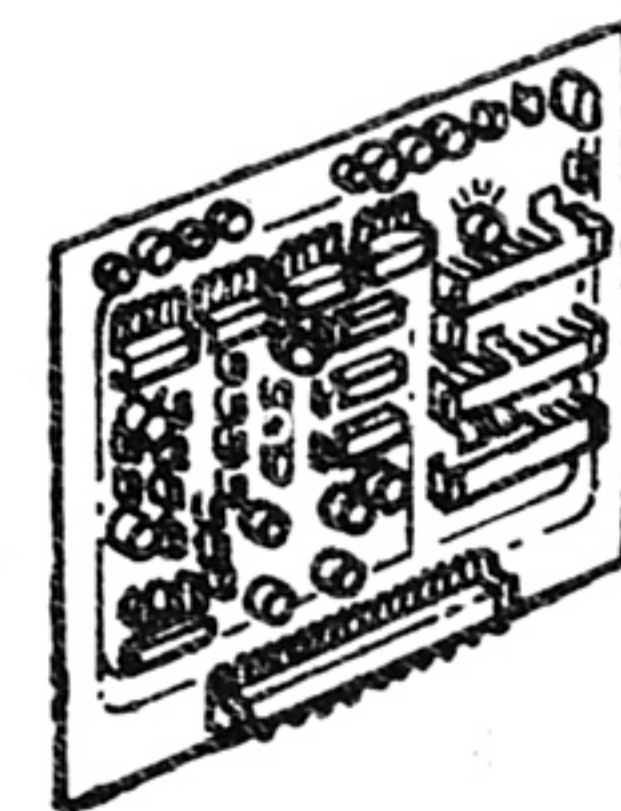
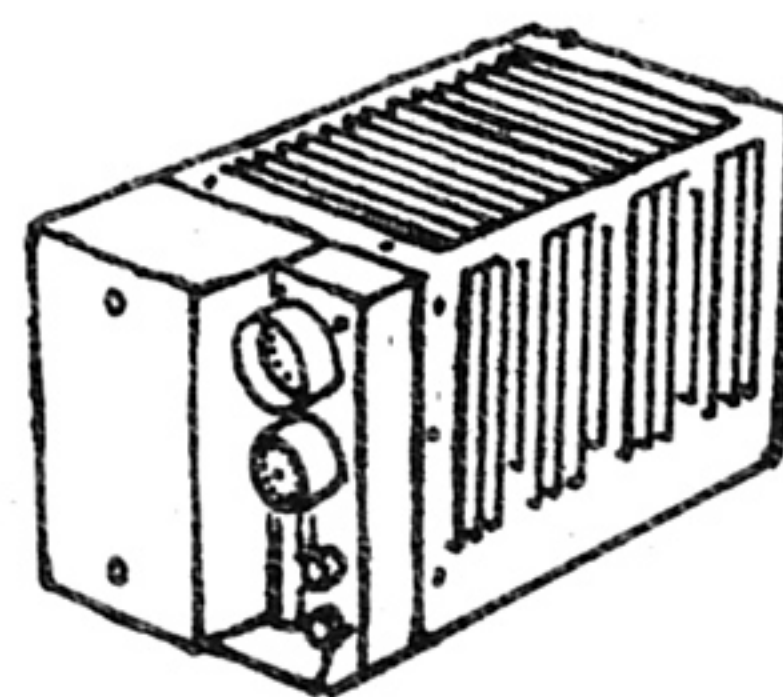
● DALMO VICTOR

● GRAND BEND

▲  
BELL AEROSPACE  
HEADQUARTERS

● TUCSON

● NEW ORLEANS



## Bell-Dalmo Merger Strengthens Both Divisions

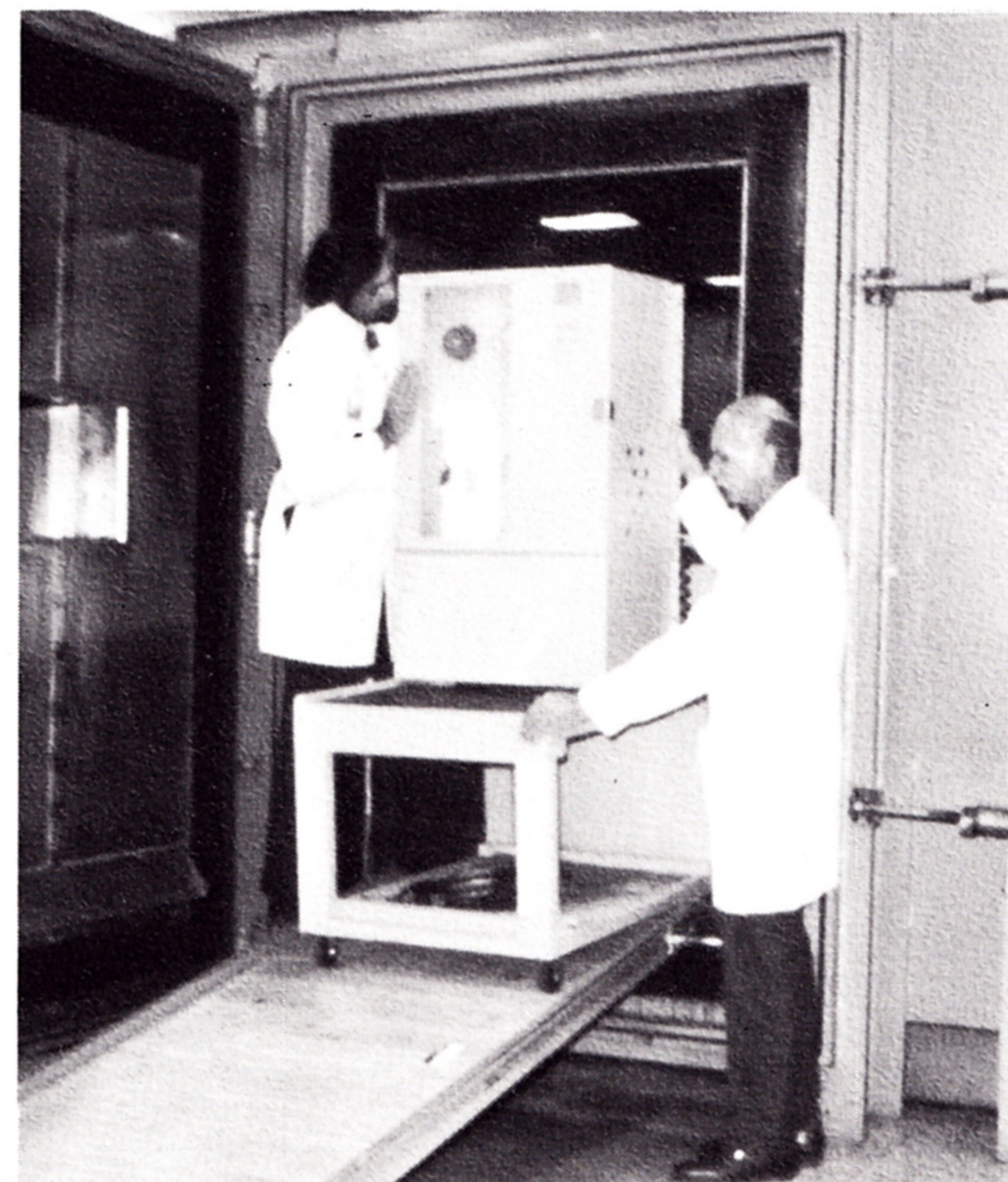
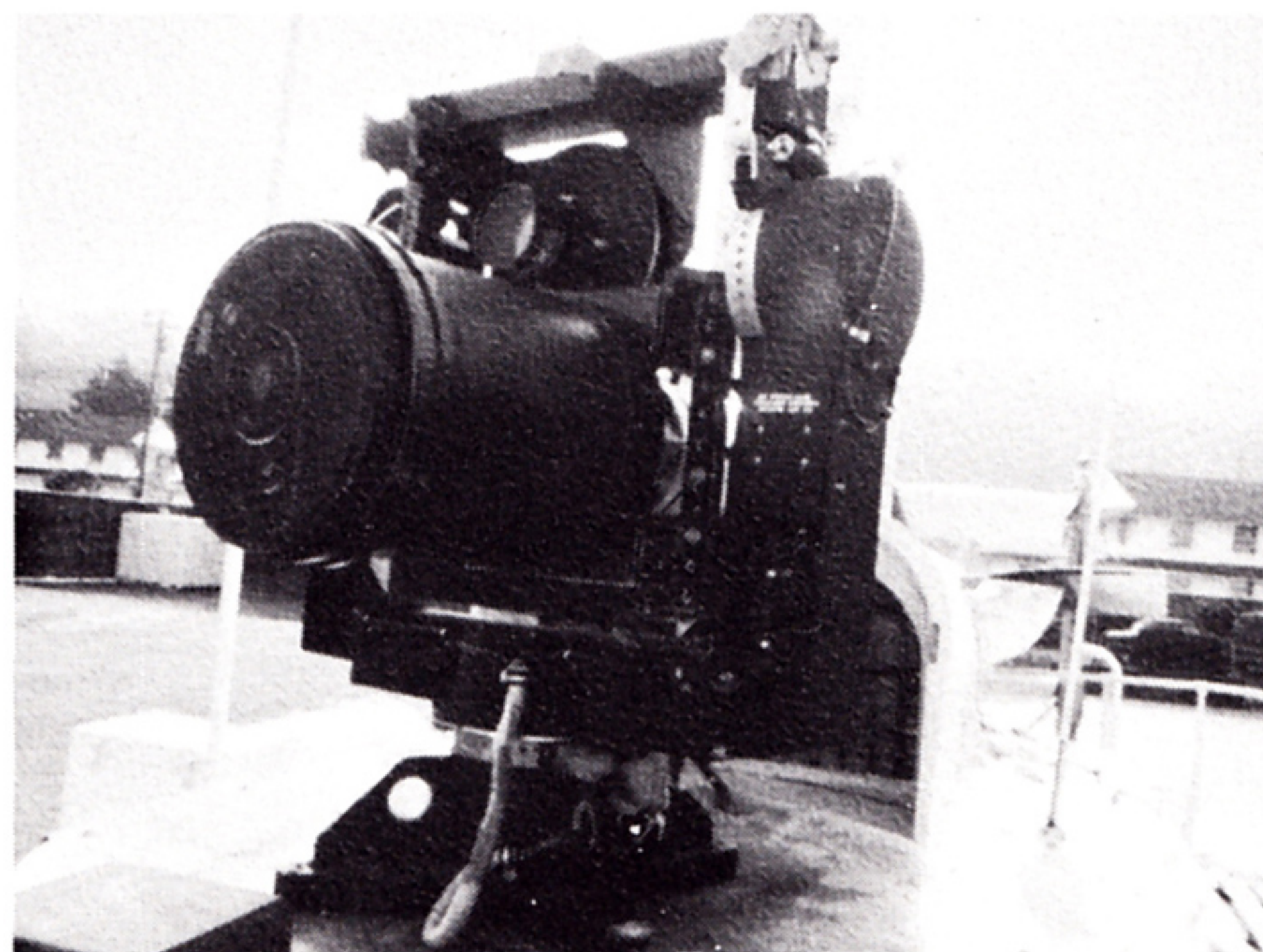
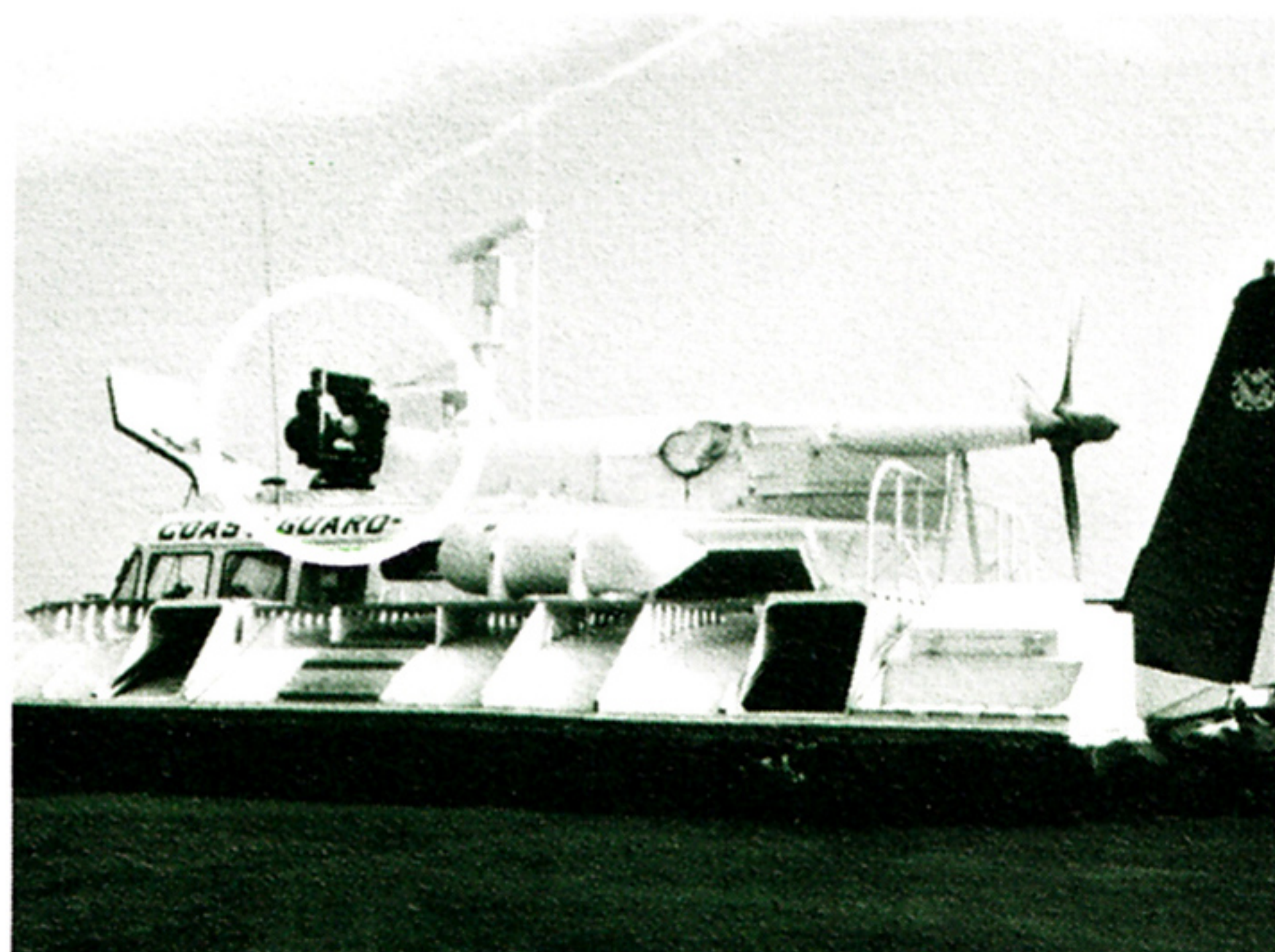
*The combination of two long-established and profitable aerospace divisions will strengthen and broaden the capability of both.*

**T**HE geographic and technologic horizons of two divisions of Textron Inc.'s Aerospace Group broadened greatly with the recent merger of Dalmo Victor into Bell Aerospace.

The extent of the geographic expansion was immediately apparent when Textron chairman G. William Miller announced that Dalmo Victor — a sophisticated electronics company in the hills south of San Francisco — would become an operating unit of Bell Aerospace, joining other Bell facilities at Buffalo, New Orleans, Tucson and Grand Bend, Ontario.



(Right) High altitude test chamber. (Below, left) SK-5 Air Cushion Vehicle equipped with Low Light Level Television. (Below, right) LLLTV unit.



But it was the technological aspects of the merger that excited the divisions' executives, employees and customers as well as much of the rest of the aerospace industry.

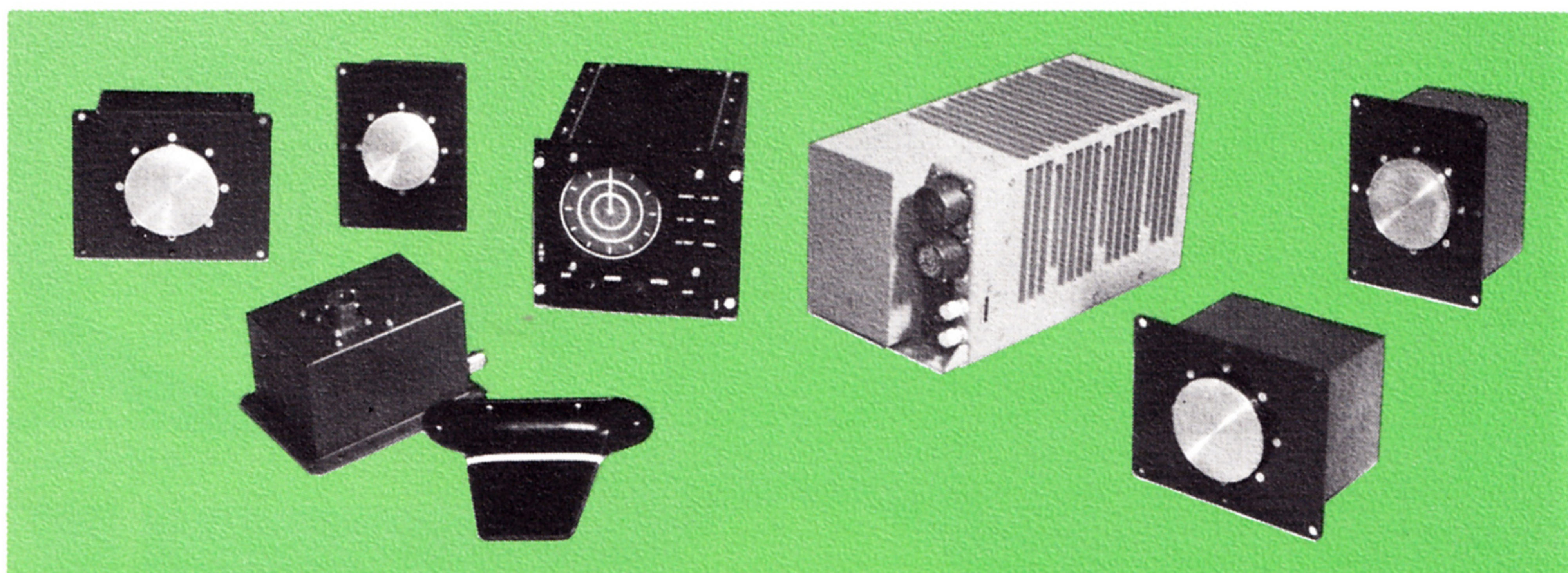
As Miller put it, "The combination of these long-established and profitable aerospace divisions will strengthen and broaden the capability of both."

The combination, he explained, brings together Bell Aerospace's recognized skills in inertial devices, structural analysis, electronic specialties and mechanical capabilities with Dalmo Victor's long-standing product leadership in electronic warfare, countermeasures, electro-optics, digital data technology and electronic test facilities.

"Customers of both companies will benefit from the expanded capability," Miller emphasized.

Bell and Dalmo Victor have worked together on several projects in the past. Dalmo's antennas have been used as part of Bell's automatic aircraft landing system. Dalmo's Low Light Level Television has been tested as a forward-viewing system on Bell's SK-5 Air Cushion Vehicle during trials in San Francisco Bay. Bell's Lunar Landing Training Vehicle and positive expulsion tanks and Dalmo's communications antennas played important roles in making the moon landings possible. Bell also developed the ascent engine which lifted the astronauts off the moon.

The formal combination of the people and technology of the two strong divisions will further strength-



*Airborne Integrated Defense System components.*

en the capabilities of both operations.

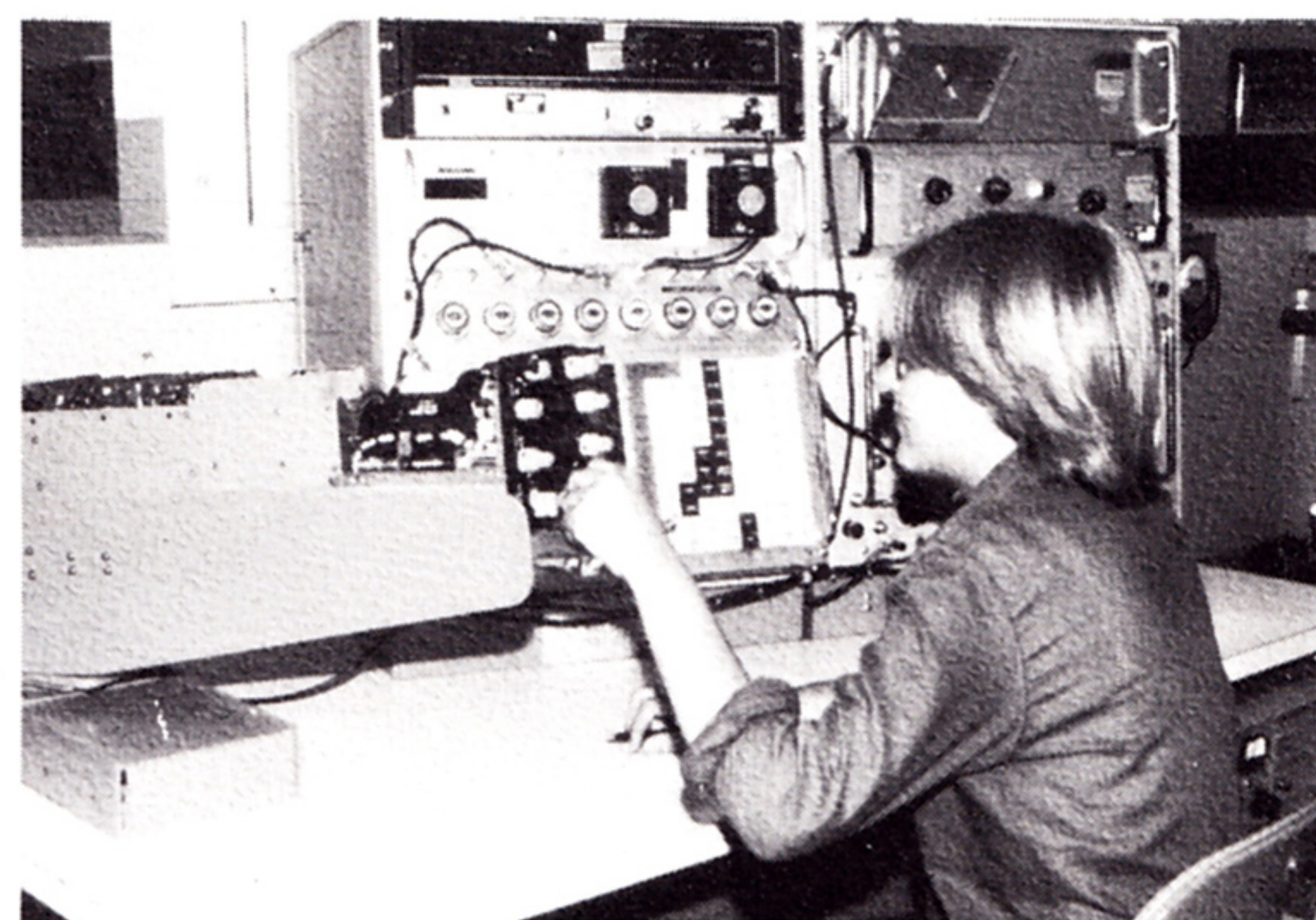
Dalmo Victor is the nation's leading manufacturer of electronic equipment which enables the military pilot to protect his aircraft and crew from enemy attack.

Dalmo Victor identifies its major product as Airborne Integrated Defense Systems (AIDS).

When an enemy weapon is aimed at an aircraft—airplane or helicopter—the weapon unavoidably radiates telltale electromagnetic signals which can reveal its presence to suitable sensors.

The most common telltale signatures are radar waves, but modern sophisticated threats also include laser beams and infrared radiation.

Using sophisticated electronics, AIDS sense the presence of radar, laser and infrared enemy signatures, determine the locations of the threats, decide what types of weapons the enemy is aiming or firing, and enable the pilot to take effective countermeasures.



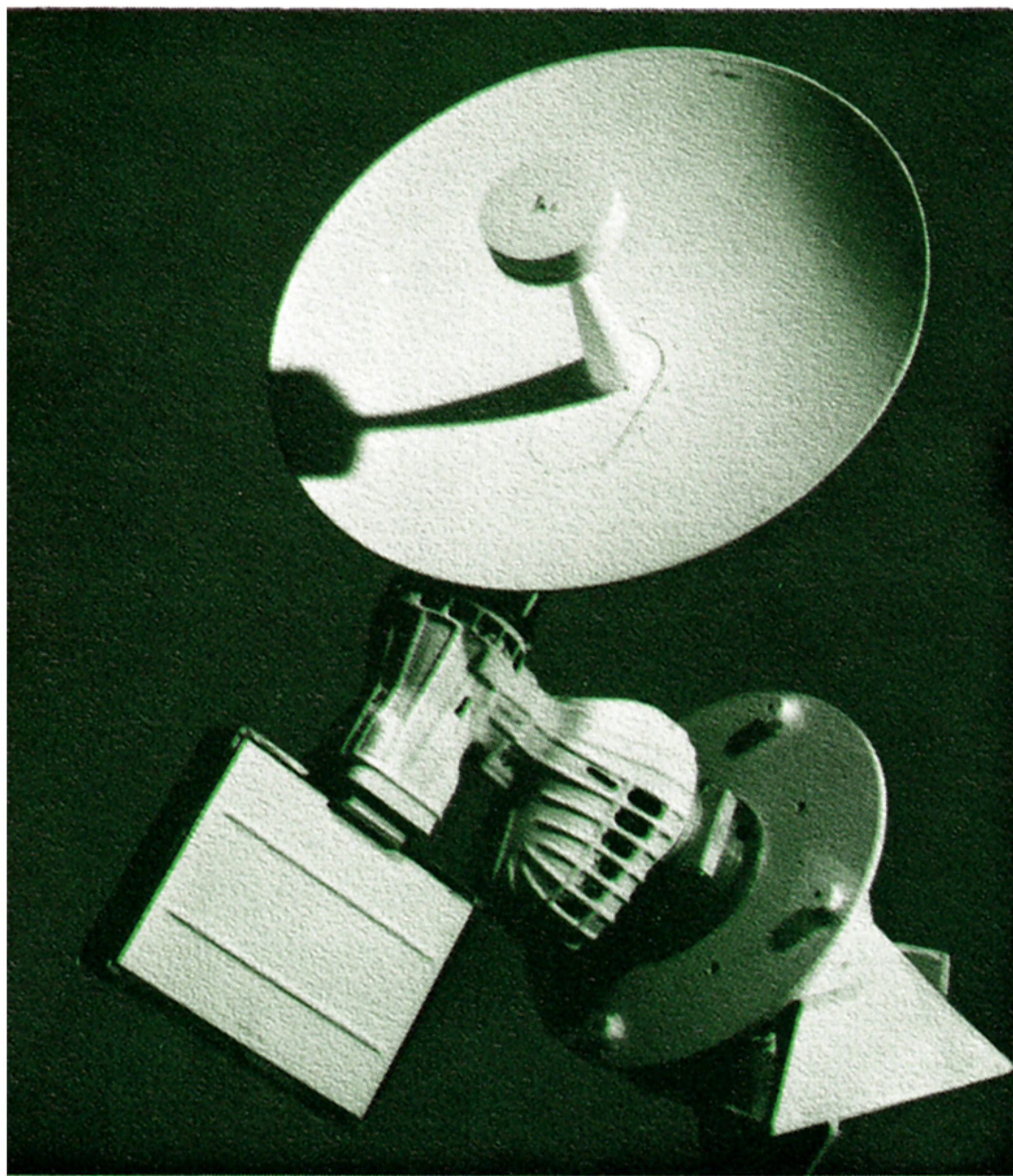
*System testing.*

Dalmo Victor's AIDS are complete electronic systems composed of sensors, signal processors, output displays and countermeasure equipment.

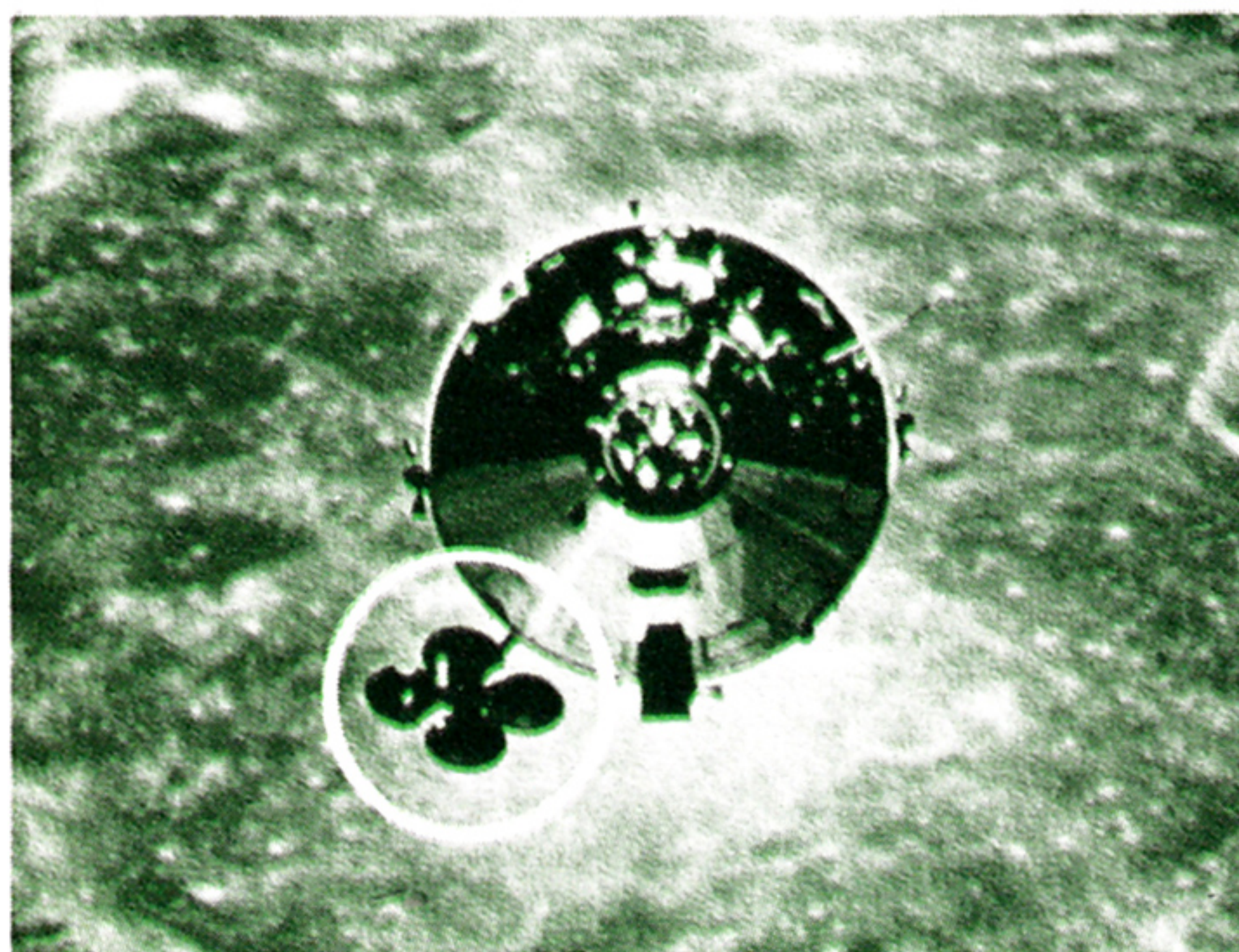
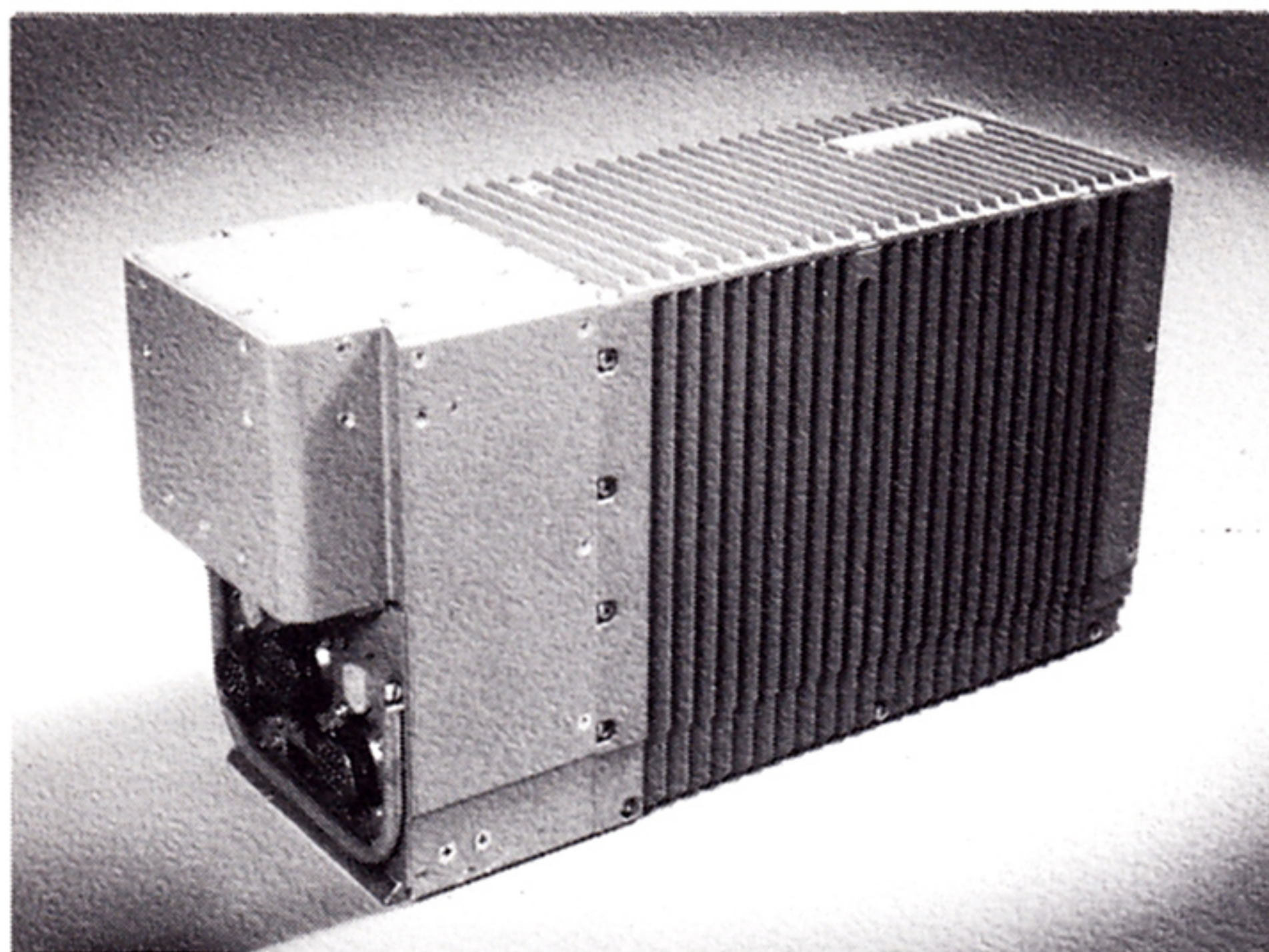
AIDS include various types of sensors which scan the electromagnetic environment around an aircraft to sense the presence of radar, laser aiming devices and the infrared radiation from missiles and guns.

These complex electromagnetic signals are then processed, sorted and identified by a digital signal analyzer which presents threat informa-

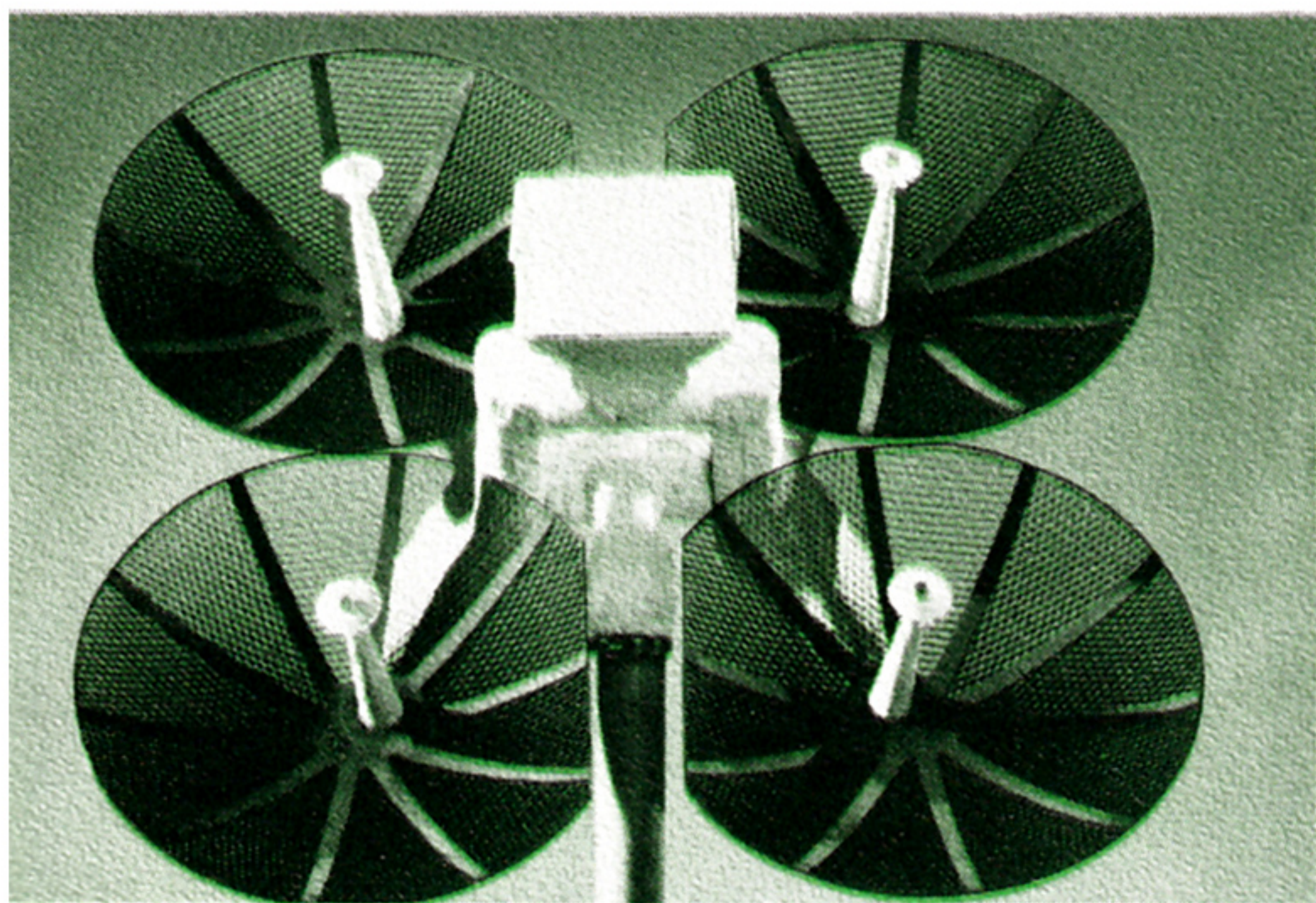




*(Left) Dalmo Victor Lunar Module (LM) space antenna. (Below) Mini-computer or digital signal analyzer.*



*(Above, left) Materials laboratory analysis. (Above) Apollo space capsule with DV antenna.*



*Apollo communications antenna.*

tion in audio and visual form to the pilot. This same digital information can be used to automatically and effectively command such defense mechanisms as jamming, chaff and flare dispensing, and weapons delivery against the enemy threat.

The heart of Dalmo Victor's AIDS is the digital signal analyzer, or mini-computer, which provides a completely automatic way to sort, identify and track electromagnetic pulse information in the crowded electromagnetic environment.

Dalmo Victor developed the

world's first digital signal analyzer with company funds in a 1969 in-house program. The resulting advanced-digital processing system is a unique improvement on older analog systems. With Dalmo Victor's product the pilot sees enemy threats represented on a map-like scope display as easily recognizable alphanumeric signals instead of as a series of confusing blips and patterns as on an analog system scope.

Dalmo Victor's digital signal processor is the only mini-computer type currently being taken into the U.S. government inventory. Advanced systems using these modern Dalmo Victor signal processors are currently being produced in large quantity and are being installed in all types of combat aircraft—fighters, bombers and helicopters.

The Dalmo Victor system—which displays threat information in coherent symbol form—makes critical decision making much easier and provides significantly better protec-



*Directing the complex work of Dalmo Victor is division president John H. Pamperin.*

*A native of Green Bay, Wisconsin, Pamperin is a graduate of the University of Wisconsin, where he received his BS degree in engineering.*

*He came to Dalmo Victor in 1967 from American Standard, Inc., where he was president of the firm's Advanced Technology division. Earlier he had been vice president and general manager of Systron Donner Corp., a California integrated electronics firm.*

*Pamperin was named executive vice president of Dalmo Victor in 1968 and president in 1969. With the joining of Bell Aerospace and Dalmo Victor, he also became a vice president of Bell Aerospace.*

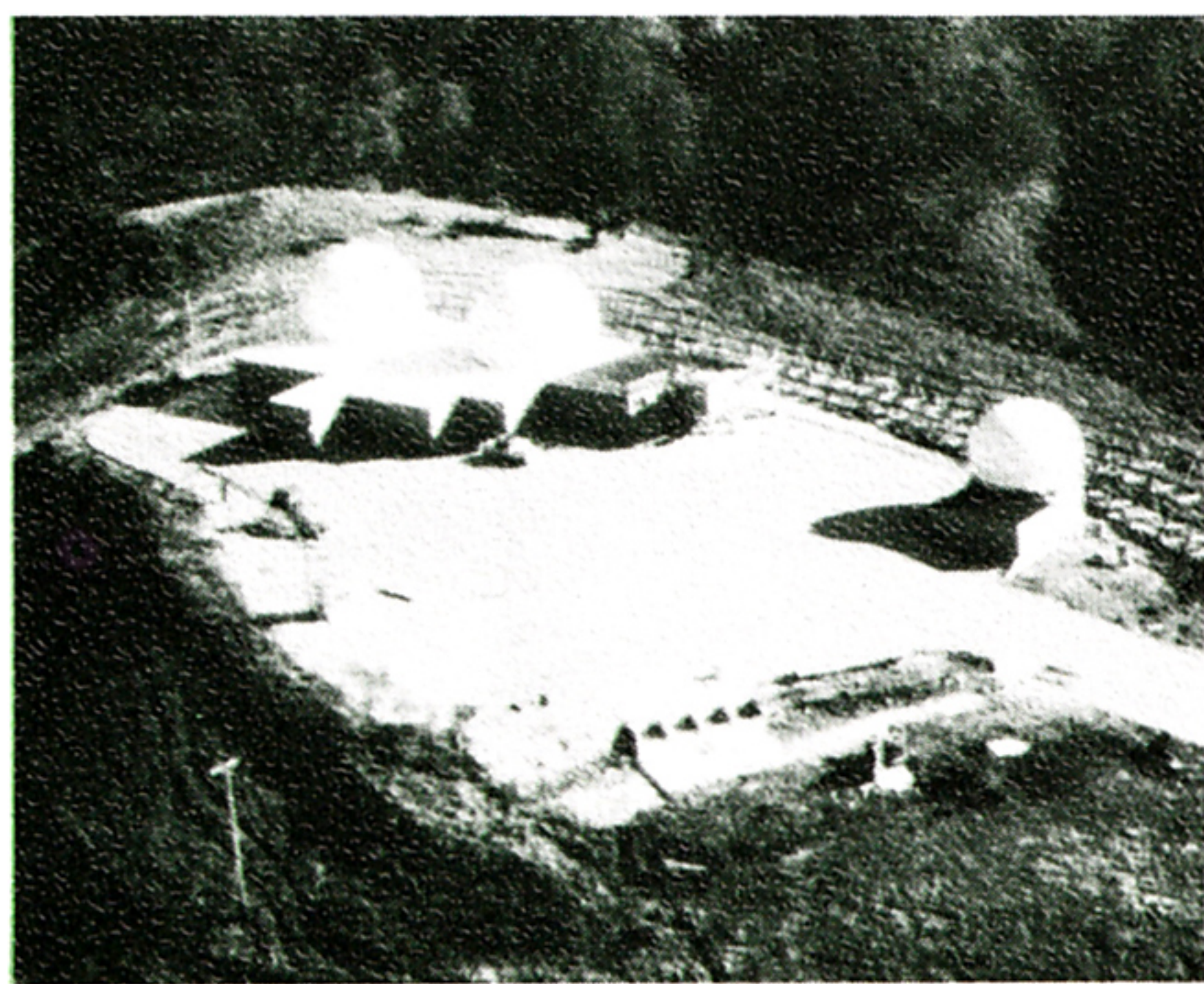
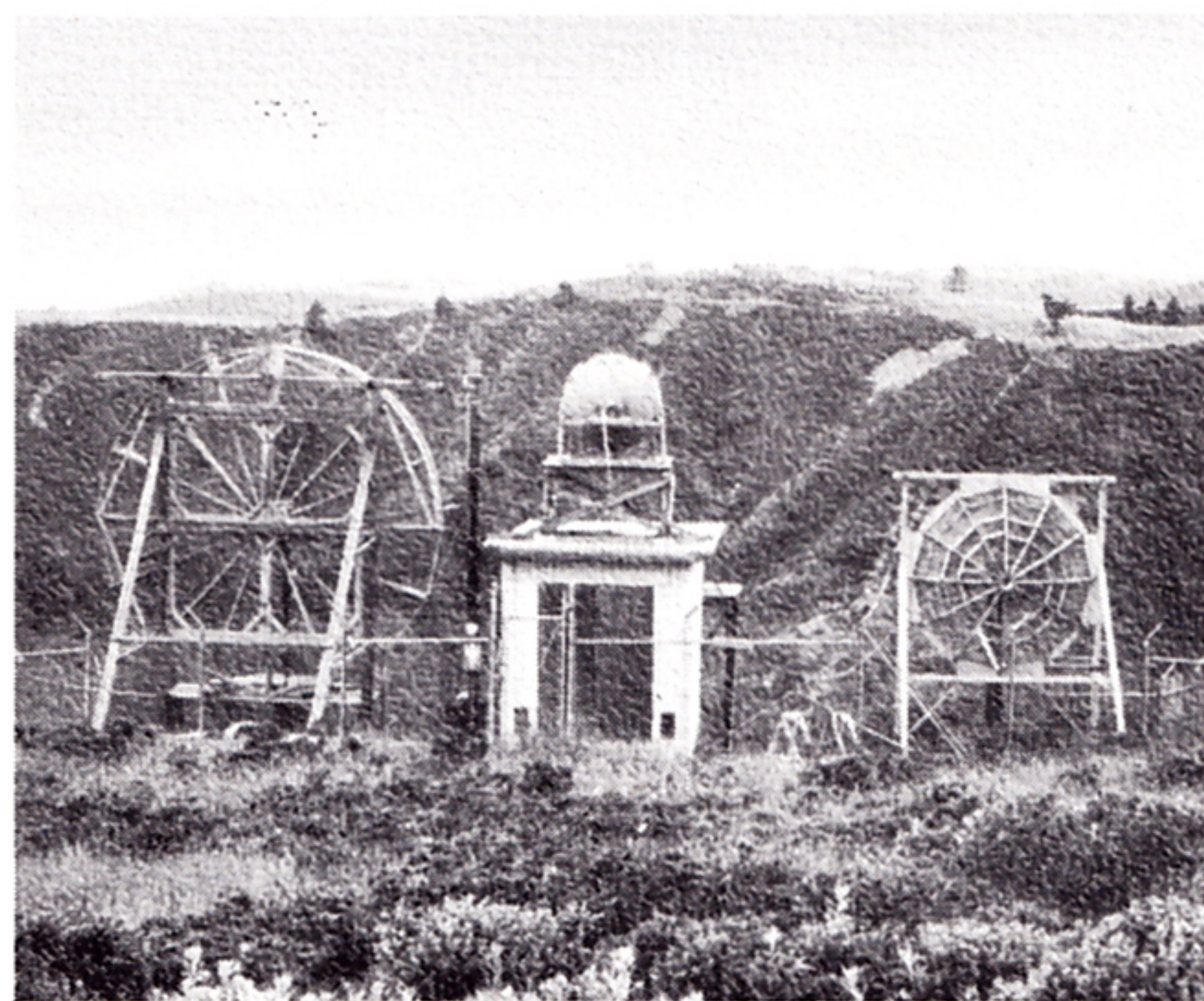


tion to the aircraft and crew.

Not only the U. S. Government, but the governments of other nations have recognized the importance of electromagnetic defense systems. Dalmo Victor has demonstrated its digital radar warning system to various approved nations and has received contracts from several.

Dalmo Victor's research and development programs also have made the company a leader in the field of electro-optics. The company has participated in the development of many new electro-optical systems for special military and NASA programs. These include many night vision systems generally known as Low Light Level Television (LLTV).

LLTV equipment allows the taking of television pictures in virtually



*Radar ranges at Half Moon Bay.*

complete darkness — an important technique with many military and commercial applications.

Dalmo Victor's LLLTV systems have found application for such diverse purposes as search and rescue work, hydrofoil navigation aids, oil spill monitoring, and patrol boat fire control systems. Units have been sold to various foreign countries for each of these applications. Japan, Italy, Australia and Israel are important customers in these areas.

Headquartered in Belmont, California, in the heart of the Bay Area "electronics belt," Dalmo Victor's facilities include some of the most advanced radar and electronics countermeasure testing equipment in the world.

Operations include a radar test range at headquarters plus a radar range about 25 miles away at Half Moon Bay, overlooking the Pacific Ocean.

The company also has several anechoic test chambers for testing radar and other electromagnetic equipment without interference from outside signals, as well as atmospheric simulation chambers for testing equipment under a variety of weather and atmospheric conditions.

These facilities and others combine to give Dalmo Victor an unsurpassed capability in developing and testing advanced electronic countermeasure systems.

The combination of Bell and Dalmo brings together two outstanding organizations with long and colorful histories.

Dalmo Victor dates back to 1921 when a 19-year-old mechanical genius named Tomlinson Irving Moseley opened a small metalworking job shop in San Francisco.

Young Moseley, a prolific inventor, personally developed much of the firm's early product line, which included thermostats, oil preheaters and hairdressing equipment. Thanks largely to Moseley's inventiveness, Dalmo survived the Great Depression and by the end of the 1930s expanded its product line to include electric razors, electric toothbrushes, exercise machines, flush valves, fishing reels and even duck decoys.

The advent of World War II brought Dalmo into the defense business and in 1942 the company was called upon by the Massachusetts Institute of Technology's microwave laboratory to develop an all-purpose radar antenna for use on board aircraft.

The successful development of an airborne radar antenna set the company solidly into the electro-mechanical field and marked the turning point in the firm's history as Dalmo Victor rapidly became an established leader in the airborne radar antenna field.

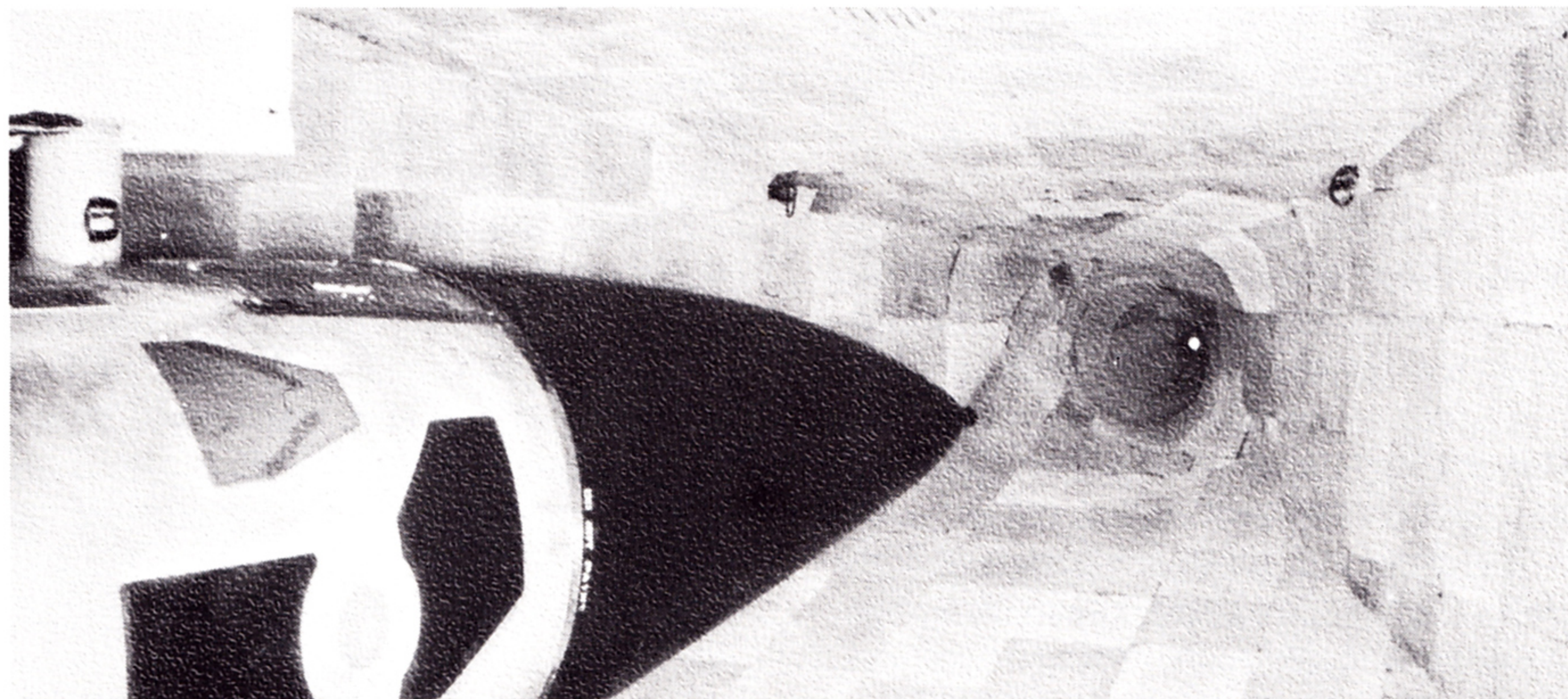
Dalmo Victor's antenna capability leadership was dramatically demonstrated in the 1960s and 1970s during the U.S. manned space missions.

The antennas made by Dalmo Victor were indispensable for the vital telemetry, crisp audio and clear television pictures from the moon.

When astronaut Neil Armstrong first stepped on the moon, he was heard and seen by 700 million persons through Dalmo Victor antennas.

Dalmo Victor currently is developing an antenna to be used on the American-Soviet, Apollo-Soyuz space mission in 1975.

A major company milestone came in 1954 when Textron purchased

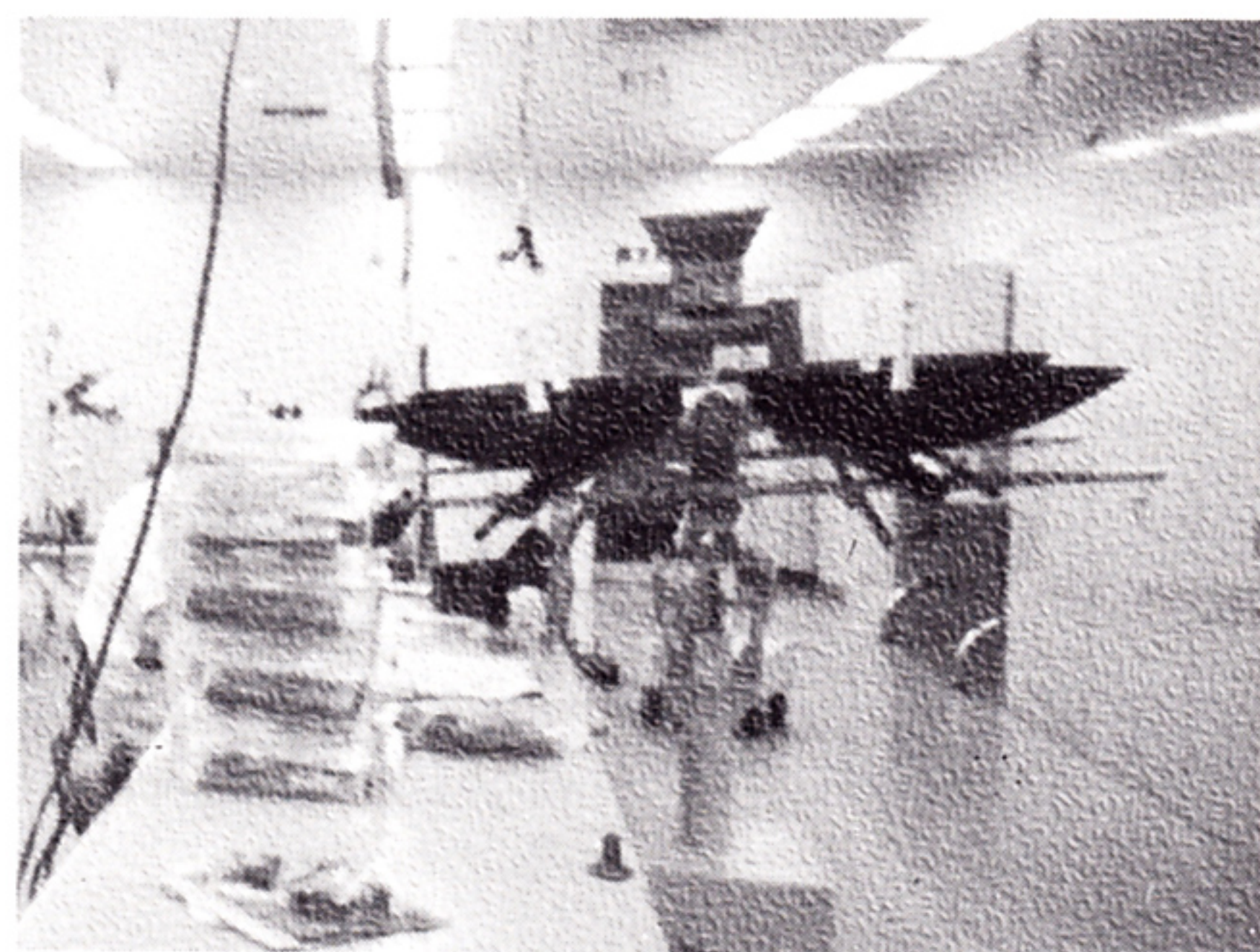


*One of Dalmo Victor's anechoic chambers for testing radar and other electromagnetic equipment.*



Dalmo Victor and established the company as an autonomous division under the same management.

Textron acquired the defense facilities of Bell Aircraft Corp. in 1960 and later reorganized the company into the Bell Helicopter, Bell Aerospace and Hydraulic Research and Manufacturing divisions. Today Textron has 181 plants, 66,000 employees and annual sales of more than \$1.8 billion. ■



*Apollo-Soyuz antenna in a Clean Room.*

### What's in a name?

Dalmo Victor's name was derived from several sources.

When the company was founded—on May 1, 1921—it was called the Dalmo Manufacturing Company. Founder T. I. Moseley derived the name from the first part of the last name of his silent partner, A. J. Dallman, ("Dal") and the first part of his own last name ("Mo").

The "Victor" was added in 1941 when Moseley acquired another partner named Earl S. Douglass. Douglass was a son of the founder of the Victor Talking Machine Company and added the "Victor" name to the firm.

Bell Aerospace's name is derived from its founder, Lawrence D. Bell, who founded Bell Aircraft Corporation in 1935.

Textron's name recalls the fact that the multi-market corporation had its origin in the textile business.

## Oregon Technical Products

Although it is not strictly in the aerospace business, the Oregon Technical Products unit is an important part of Dalmo Victor's operations.

Located in Grants Pass, Oregon—a friendly community of about 13,000 persons located in the Rogue River Valley some 400 miles north of San Francisco—Oregon Technical Products is a small but significant electro-mechanical and electronic production house which manufactures a wide variety of products for military and commercial customers.

The facility was founded in 1962 to assemble portable mine detectors for the U. S. Army. Later military products included mine firing mechanisms, wiring harnesses for aircraft wiring analysis, weather measuring equipment and other products.

Today Oregon Technical Products is primarily involved in four basic areas of business, as a subcontractor to (1) other Textron divisions, (2) military and defense agencies, (3) commercial manufacturers and (4) as a prime contractor for a line of Dalmo Victor developed automatic test equipment for diesel locomotives, and other rail and transit products.

The locomotive testing system, known as SEARCH (System Evaluator And Reliability Checker), is a digital analyzer which can automatically analyze about 1,000 test points of a locomotive.

Oregon Technical Products (OTP) has sold its rail and transit products—SEARCH—to railroads in Canada and Mexico. The Iranian state railroad is a current prospective customer. In addition, Germany, Japan and Israel have bought OTP military/defense products.

Oregon Technical Products also produces an automatic X-ray film processor for Filamatic/General Electric. The processor, which develops X-ray film in a short time, is used in many hospitals, clinics and health facilities.



*Oregon Technical Products headquarters*



# SAMSO AGENCY MARKS 20<sup>TH</sup> YEAR

**B**ELL Aerospace is proud to salute the U.S. Air Force's Space and Missile Systems Organization (SAMSO), which this summer is celebrating the 20th anniversary of the founding of the original Air Force space agency.

The Air Force officially entered the space age in 1954 with the founding of the Western Development Division of the Air Research and Development Command.

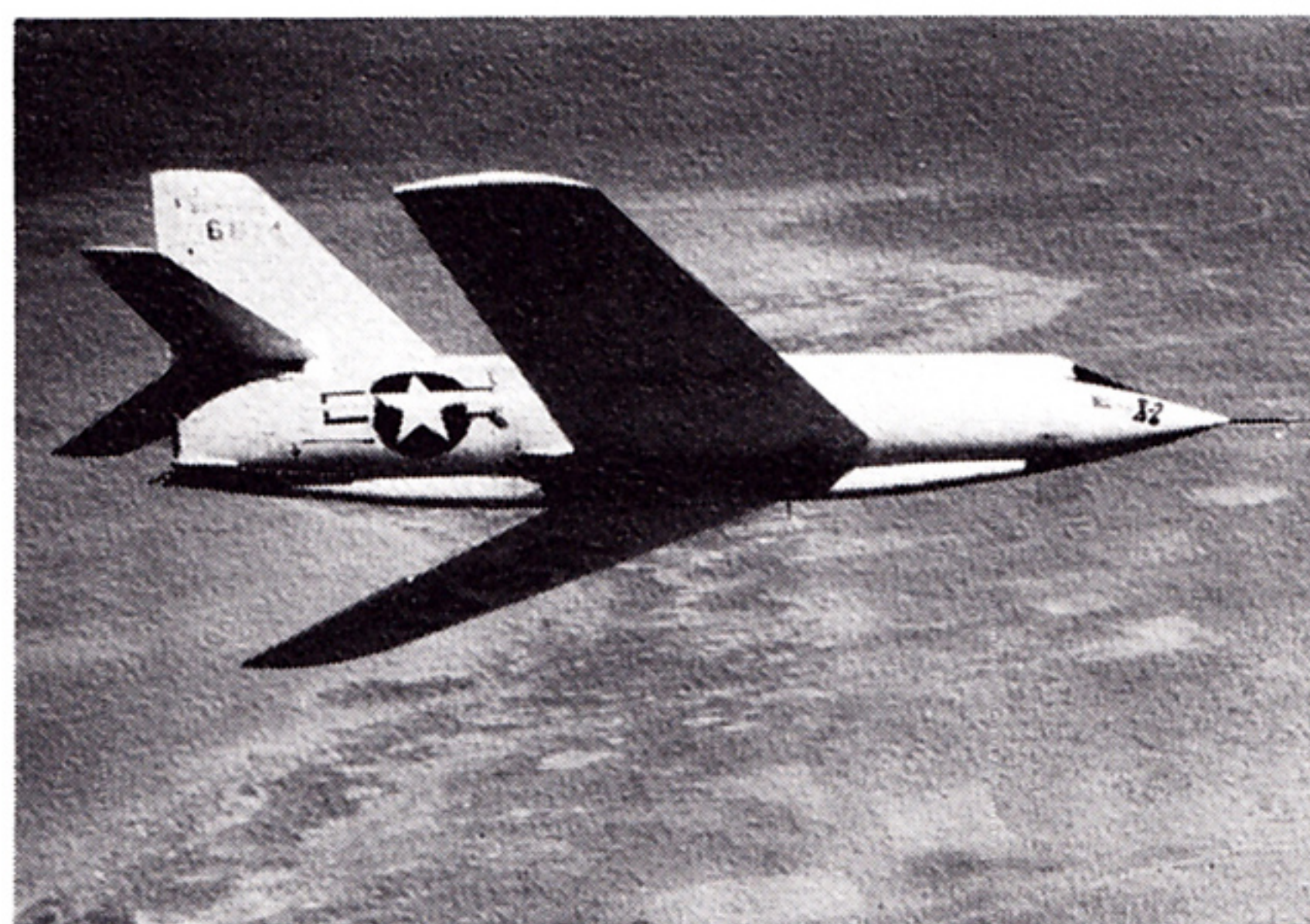
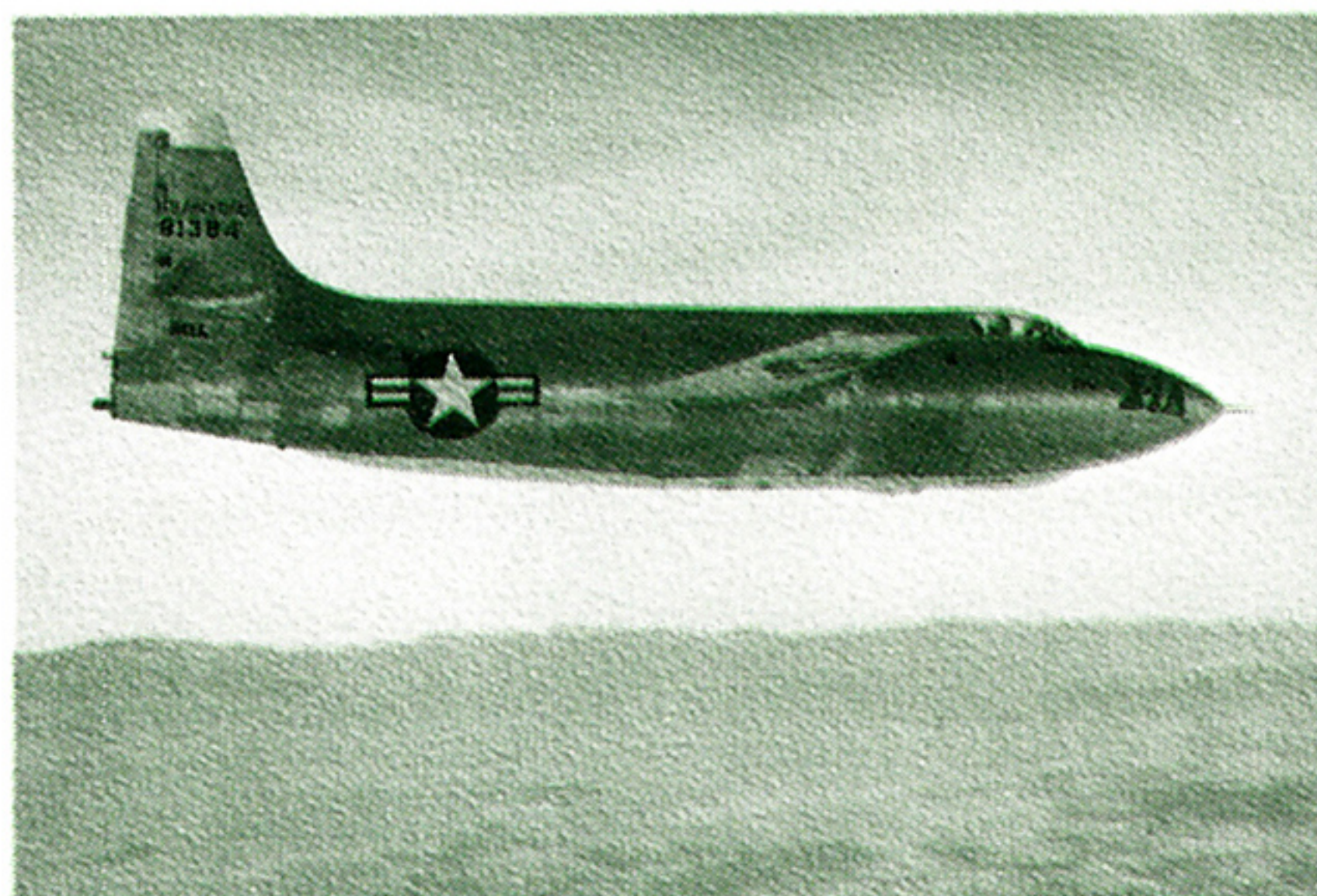
Begun as the first Air Force unit responsible for development of an intercontinental ballistic missile, the Western Development Division, and later, SAMSO, have teamed with the aerospace industry in bringing about remarkable progress in space technology.

As a member of the Air Force Space team since the beginning, Bell Aerospace has developed many advanced concepts in missile and rocket technology, such as the X-series aircraft, the Rascal missile, the Agena engine and the Minuteman III post-boost propulsion system.

Bell's earliest contribution was the X-series of experimental aircraft which took man higher and faster than ever before.

By July 15, 1954, when the Western Development Division was founded, the Bell X-1A was being prepared for a flight to 90,000 feet.

Two years later, the Bell X-2 flew 2,148 miles per hour at an altitude of 126,200 feet. The technology then was at hand to put man into Earth orbit.



X-1A (above), X-2

Textron's Bell Aerospace Division, formerly Bell Aircraft Corp., built 13 aircraft in the X-series and provided the reaction-control thrusters used in the X-15. Bell built similar thrusters for the nation's first manned space vehicle, the Mercury Capsule.

The Mercury Space Capsule reaction control system provided by Bell allowed the first astronauts to maneuver in orbit. Bell's work in developing and building reaction control systems continues today.

Bell's Rascal missile was another vital technological step towards today's Air Force missile capability.

The need for an air-to-surface missile capable of large scale destruction became apparent during World War II when many American bombers were lost to heavy enemy fire while making bombing runs.

Life could be made much safer for bomber crews if a way could be developed to bomb a heavily-defended target from a safer distance, U.S. weapons planners reasoned.



Rascal (GAM-63)

The answer was Rascal, officially designated GAM-63, a 32-foot long, 4-foot diameter, rocket-powered, guided missile launched from an airborne B-47 bomber and capable of delivering an atomic or thermo-nuclear warhead to a target 100 miles away and five miles down.

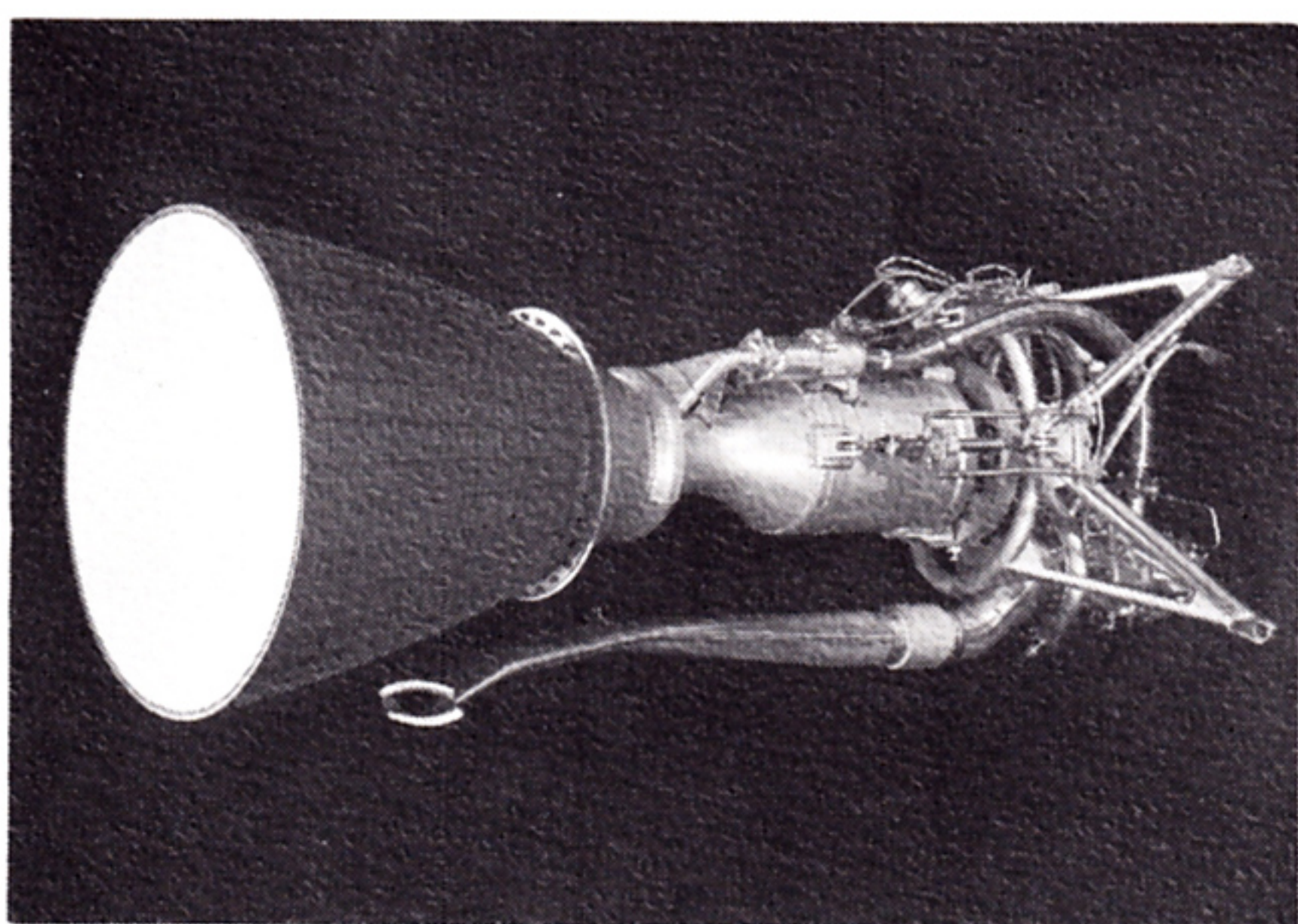
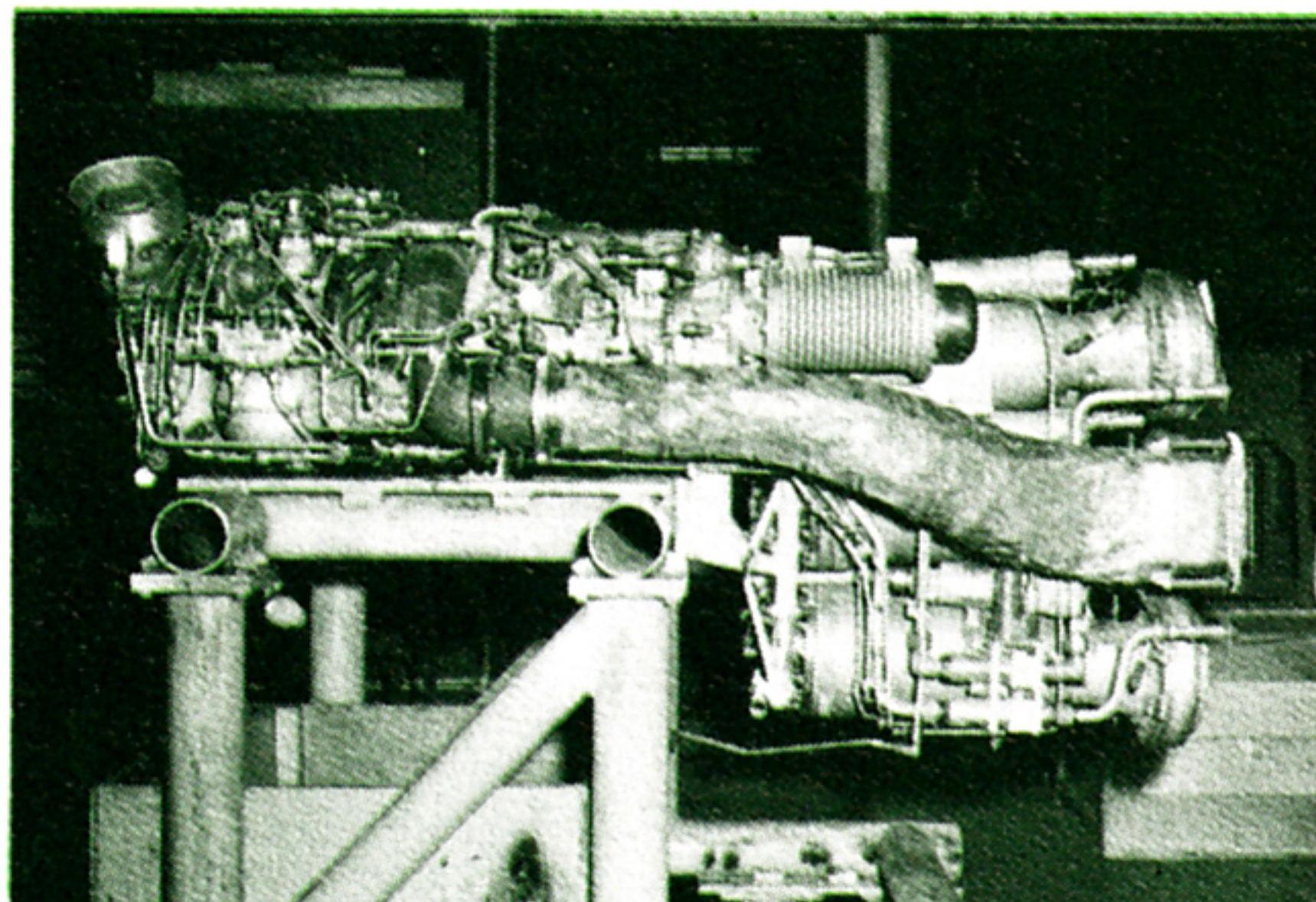
As advanced for its time as Rascal was, the fast-moving technology of the approaching Space Age soon made it obsolete as an effective weapon. Newer missiles with longer ranges were developed in the late Fifties and in November, 1958 the Air Force ended the Rascal program in favor of more rapidly advancing guided missile programs.

But the techniques used in manufacturing Rascal pioneered the way for production of many advanced spacecraft and missiles.

Rascal's rocket engine was the forerunner of one of the nation's



most reliable Space Age rocket engines, the Bell-built Agena, which has played a major role in America's progress in space for the past 15 years.



*Rascal engine (above); Agena engine*

Since its first launch from Vandenberg Air Force Base, California, in 1959, the Agena engine has participated in more than 300 Department of Defense and National Aeronautics and Space Administration launches and has played an important part in establishing orbital maneuvering control and other space exploration techniques.

The 16,000-pound-thrust engine powers the Agena Spacecraft manufactured at Lockheed Missiles and Space Company, Sunnyvale, California.

This spacecraft is a standard vehicle used in a variety of space missions including placing weather, communications and various experimental satellites into orbit.

The Bell engine is the primary propulsion unit for the Agena spacecraft. When the liftoff rockets are expended and drop away, the Bell engine supplies the additional thrust for orbit insertion. Depending on mission requirements, the engine may be restarted for space maneuvers.

In recent years, the Agena engine has placed many of the Free World's functional, unmanned payloads into orbit, including communications, weather forecasting and experimental satellites involving such programs

as the Orbiting Geophysical Observatory, the Orbiting Astronomical Observatory, the Advanced Technological Satellite and others.

Often referred to as the "workhorse of the Space Age," the Agena engine has logged a record of extremely high reliability.

In the company's major SAMSO effort today, Bell is manufacturing an extremely reliable fourth stage propulsion system for the Minuteman III missile.

After more than 550 production deliveries, the high reliability of the Propulsion System Rocket Engine (PSRE) has been demonstrated in more than 75 flight tests, nearly 50 static firings and nearly 1,000 cumulative years of standby operation.

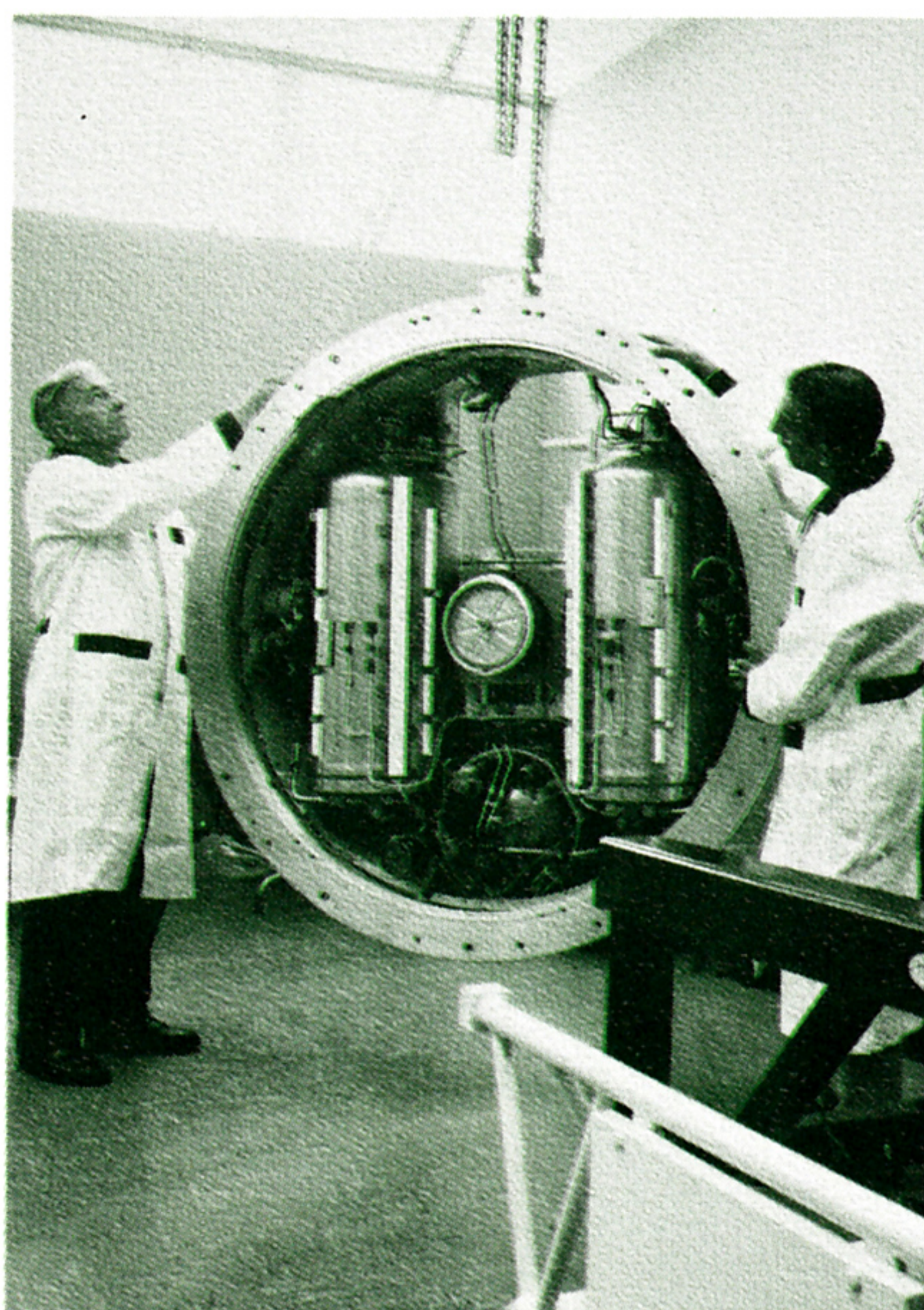
Bell's role in the Minuteman Intercontinental Ballistic Missile (ICBM) program began in the early 1960s.

Working initially in a U.S. Air Force-sponsored research and development program, Bell was successful in developing PSRE for the third in the series, Minuteman III.

Bell began the effort as a subcontractor to the Rockwell International Autonetics Division, Anaheim, California.

In early 1970, after production had started on the new system, Bell was named a Minuteman associate contractor, reporting directly to SAMSO, headquartered in Los Angeles, California.

Bell manufactures and tests the



*PSRE Assembly*

PSRE at its facilities near Buffalo and Niagara Falls, New York.

The Bell PSRE includes six 23-pound-thrust pitch and yaw engines and four 18-pound-thrust roll engines mounted around its periphery. These operate on liquid propellants.

Also included is a center-mounted 300-pound-thrust bipropellant axial engine built by Rocketdyne Division of Rockwell International Corporation.

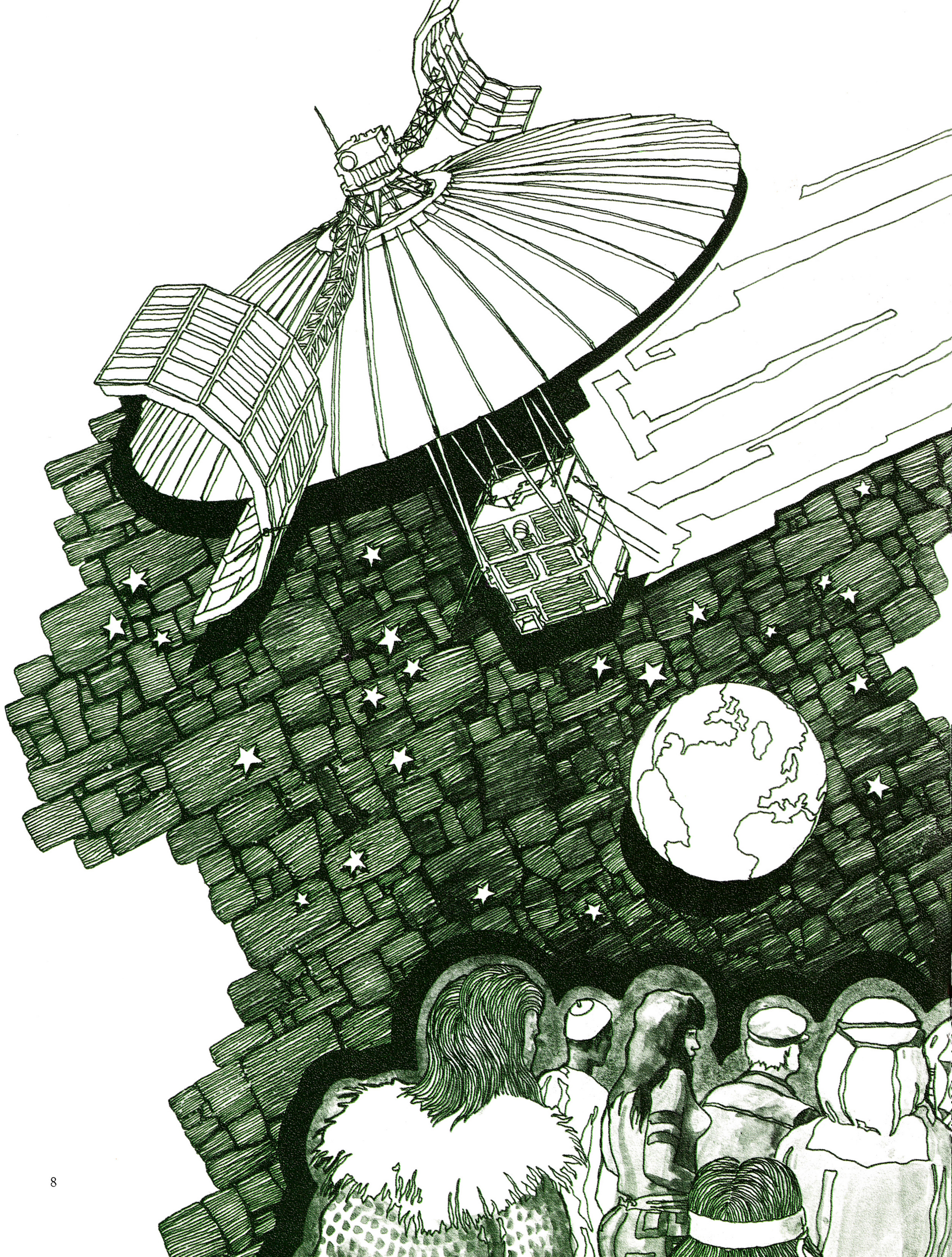
Minuteman is part of the nation's overall national deterrent force known as the "triad." Involved are three primary weapons systems — strategic long range bombers, submarine-launched missiles, and the land-based Titan II and Minuteman ICBMs.

There are 1,000 Minuteman I, II and III missiles deployed throughout the Midwest in underground silos — kept ready for launching in the event of an attack on the U.S. by a foreign power. ■

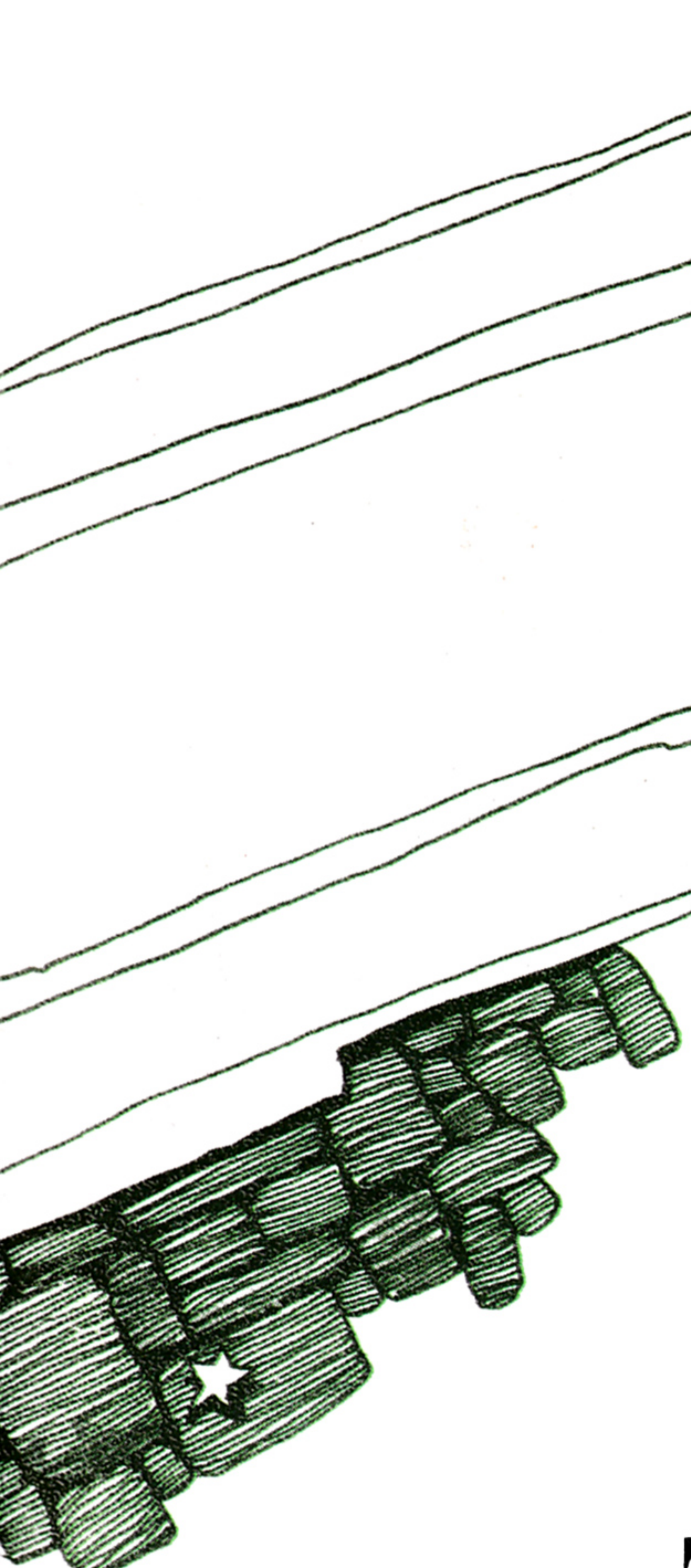


*Minuteman III*









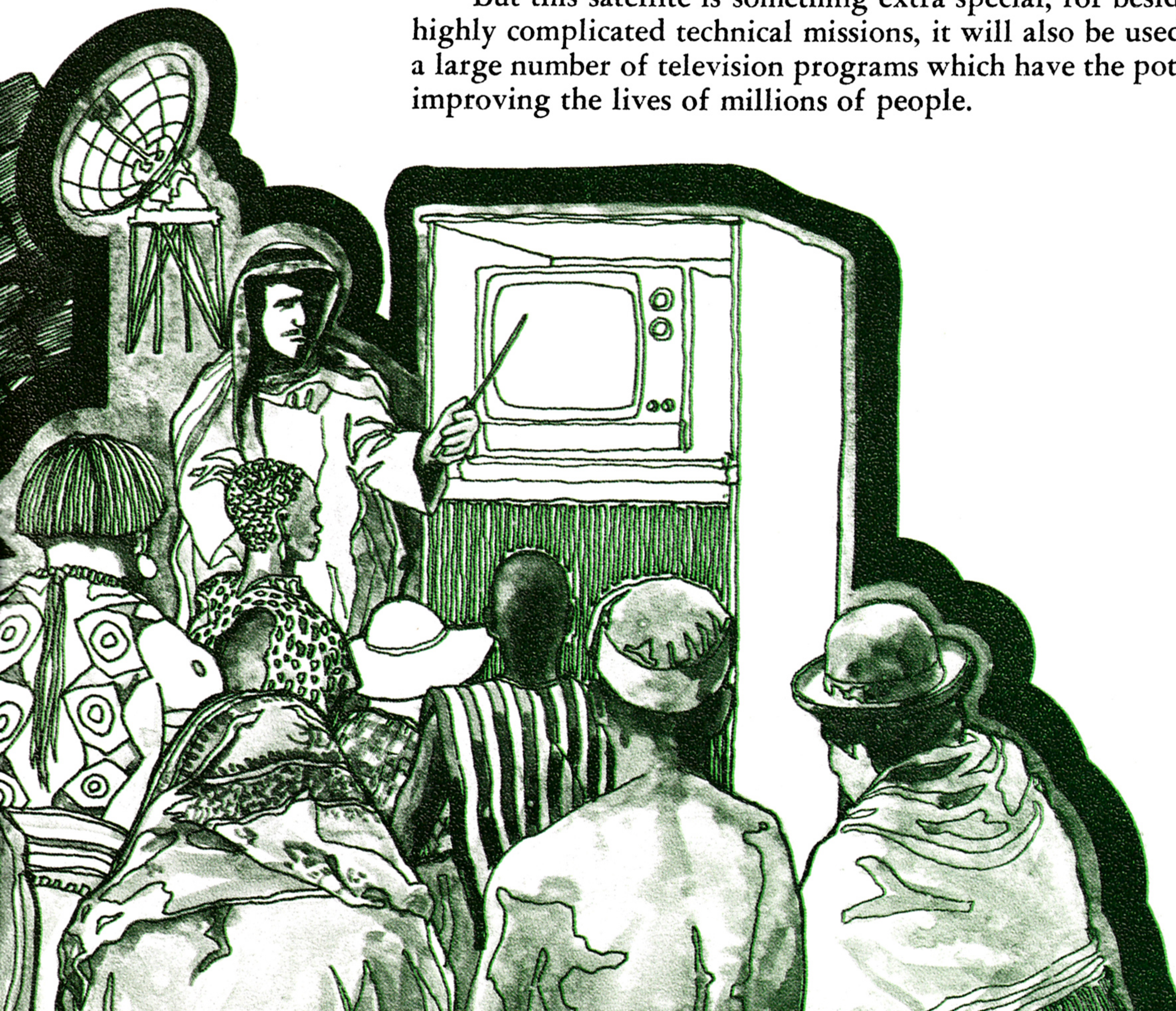
# ATS-6: Extra Special Satellite

*NASA's largest communications satellite will bring health and educational information to remote areas of the United States and India, as it performs some of the most extensive communications experiments ever.*

**T**HE world may become a smaller, smarter, healthier and safer place as a result of this summer's launch of the National Aeronautics and Space Administration's largest and most powerful communications satellite.

The satellite, called the Applications Technology Satellite (ATS)-6, is designed to perform some of the most extensive communications experiments ever attempted.

But this satellite is something extra special, for besides performing its highly complicated technical missions, it will also be used to help transmit a large number of television programs which have the potential for directly improving the lives of millions of people.





These interesting and important experiments are those which will televise programs bringing health and educational information to remote areas of the United States as well as much of the poverty-stricken population of India.

Here's how it works.

After launch the satellite will be positioned in a geosynchronous orbit over the Galapagos Islands at an altitude of about 22,300 miles. At this altitude the satellite's orbital period will be 24 hours, the same as the Earth's rotational period. In this way the satellite's motion will be synchronized with the Earth, making the satellite remain at the same spot over the Earth.

From this point in space, the satellite will be able to "see" all of the continental United States.

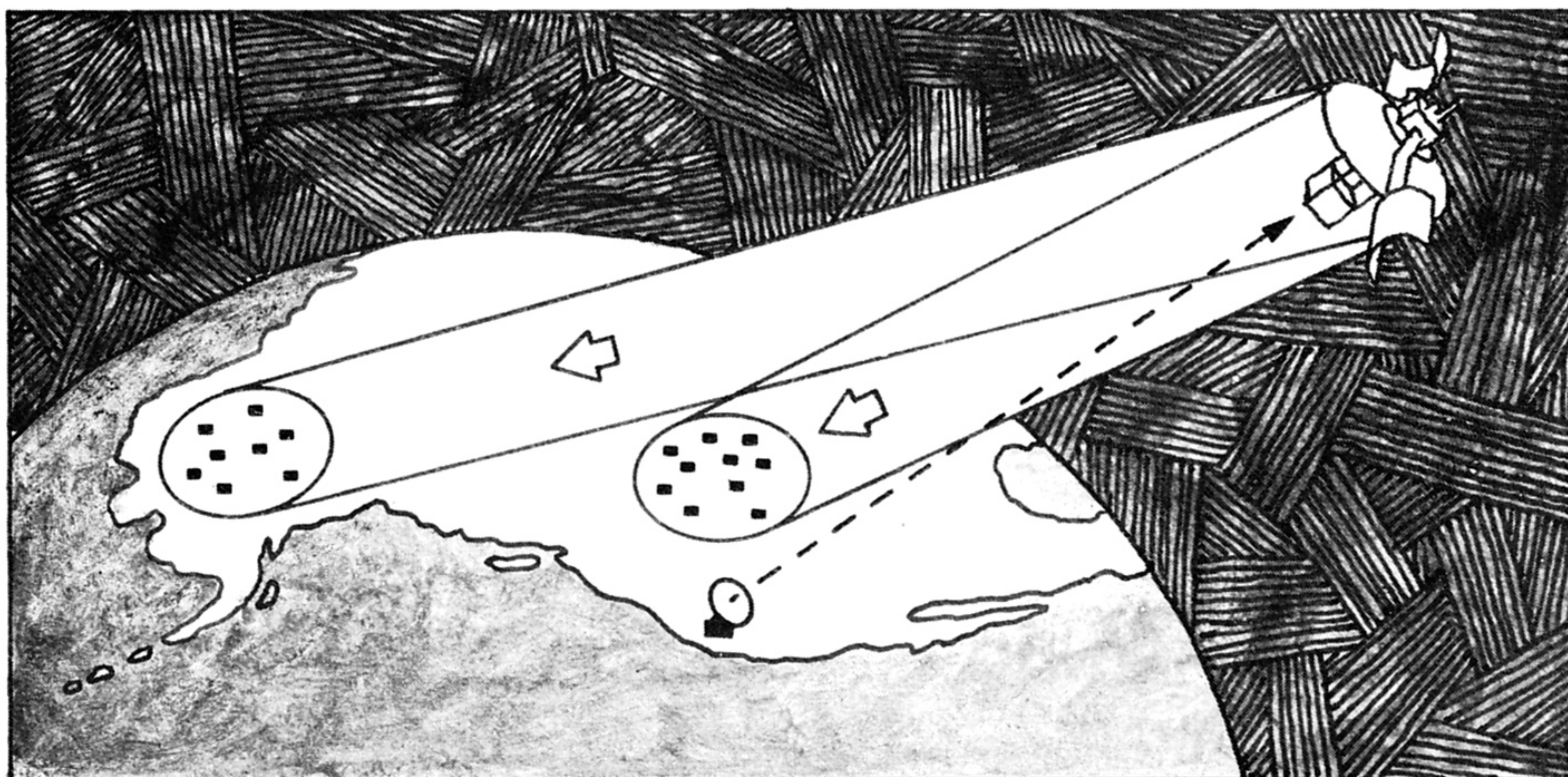
Previous communications satellites have generated signals too weak to be received properly without expensive equipment.

But the ATS-6 is equipped with two high-powered transmitters which produce television signals which can be received directly by relatively inexpensive receivers.

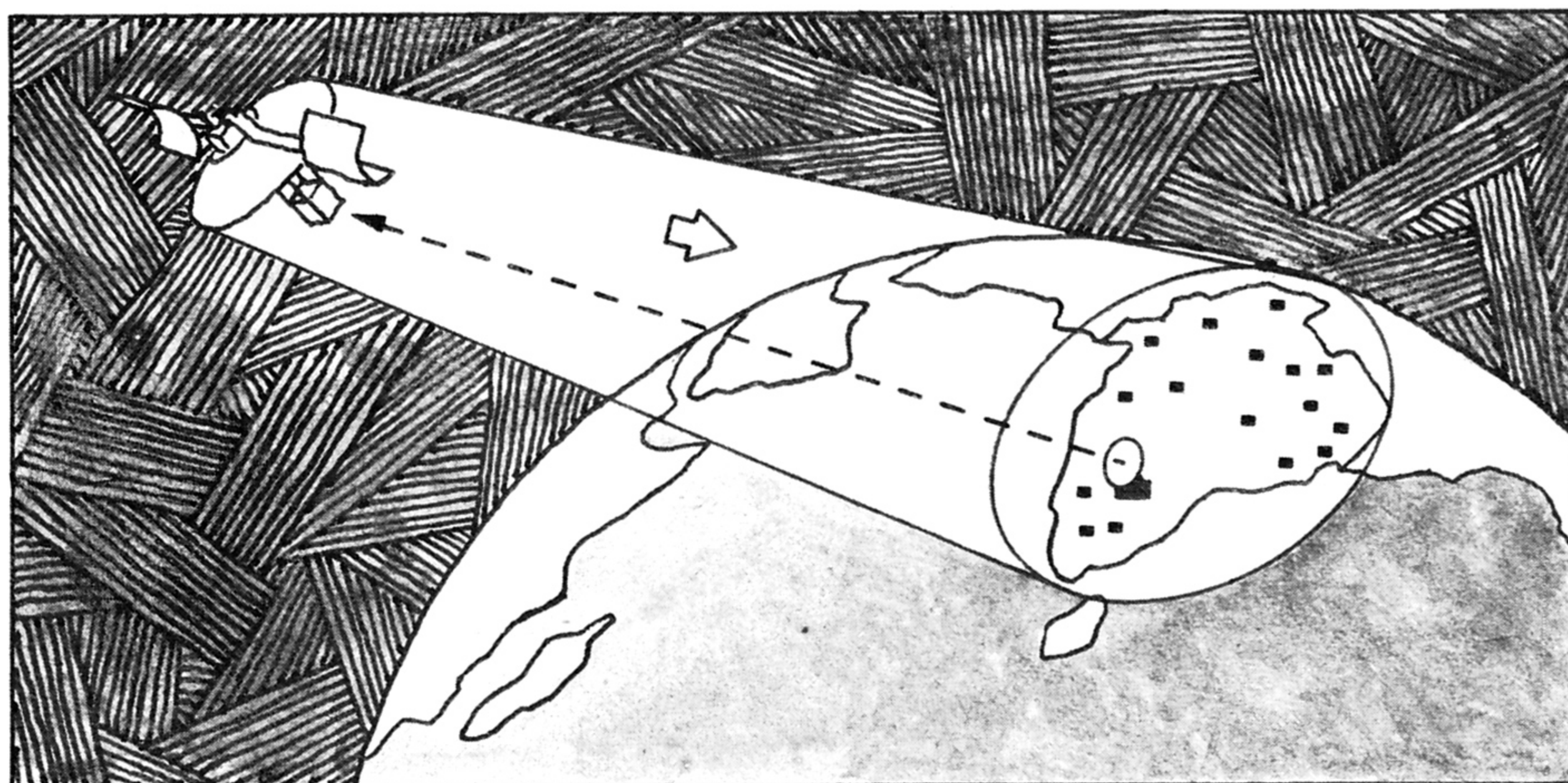
Therefore, by transmitting television signals from a powerful ground station to the satellite and then relaying the signals back to the special receivers, television programs can be picked up in remote areas where ordinary TV signals are difficult to receive.

The first of these experiments is called the Health/Education Telecommunications (HET) experiment, a joint effort of NASA, the Department of Health, Education and Welfare (HEW) and the Corporation for Public Broadcasting (CPB).

(NASA has the responsibility for the satellite and will provide access to the ATS ground stations. Other



*Educational Television transmission will utilize S-band frequency and localized one-degree beam-width spot beams.*



*A ground station in India will transmit programs at C-band to satellite which will relay signals via UHF to a network of some 3,000 community receivers.*

transmitting and receiving facilities are the responsibility of HEW and CPB).

The experiments are planned in three geographic areas, the Rocky Mountain region, the Appalachian states, and the states of Washington and Alaska, all areas where the mountainous terrain makes TV reception from ground-based transmitters difficult.

The HET experiment will pioneer delivery of high quality educational and health services to millions of Americans in those areas.

An important added feature of ATS-6 which will contribute significantly to the effectiveness of the experiment is its ability to transmit two separate color TV signals, each accompanied by four voice channels. In this way programs can be broadcast in several languages simultaneously with the viewer selecting English, Spanish or one of various American Indian dialects.

The plan calls for a combination of mainly new educational program-

ming supplemented by existing children's educational shows.

Also involved in the experiment are the Veterans Administration, the Health Sciences Administration of the University of Washington and the Alaska Health Department.

The health and medical programming involves stimulating and improving medical education, updating doctors and nurses, consultation clinics, video seminars on medical problems, and transmission of individual medical records to distant hospitals for emergency and medical diagnosis and assistance.

In one telemedicine demonstration, physicians will be able to see patients in remote areas of Alaska via television. For the past several years another communications satellite, ATS-1, has been used to relay voice consultations between health aides and physicians at remote Alaskan clinics.

The ATS-6 satellite will add a visual dimension to this program.

Prior to visual consultation, pa-



tients' medical records will be retrieved via satellite from the Indian Health Service Health Information System computer at Bell Aerospace's operations in Tucson, Arizona.

Medical records of many remote Alaska natives are stored in the Tucson computer as part of a continuing program using the ATS-1 satellite.

The programming over India, known as the Satellite Instructional Television Experiment (SITE), is intended to evaluate the potential of satellite technology for setting up mass communications facilities in developing countries and for investigating further the value of educational television via satellite.

The government of India intends to broadcast television programs to about 5,000 remote Indian villages. About 2,000 villages will have inexpensive community receivers adapted for direct reception from the satellite. The remaining 3,000 villages, located near regular TV stations, will receive programs through conventional television sets.

The Indian government will be responsible for program content and for providing and maintaining receivers. In the programming, India intends to stress improved agricultural techniques, family planning, hygiene, school instruction and culture.

Beginning in mid-1975, the experiment is expected to last about a year. If the experiment is successful, India will acquire its own television satellites and use them as a major tool to carry elementary and adult education to its 500,000 villages in an attempt to break the back of illiteracy, which for centuries has impaired the country's economic growth.

Another of the major experiments to be conducted by the ATS-6 will

be the use of the satellite to obtain test data on the characteristics of an air traffic control system employing a satellite relay.

Called the Position Location Aircraft Communications Experiment (PLACE), NASA will use a combination of existing ground stations and synchronous orbit satellites for position location and voice communications with specially equipped aircraft over the North Atlantic.

The PLACE experiment, a forerunner of an operational system for the 1980s, will use ground station and airborne electronics equipment designed and manufactured by Textron's Bell Aerospace Division.

The experiment involves both the Federal Aviation Administration and the Maritime Administration in providing continuous communications and navigation information between aircraft and ground control stations. Results will be used in later operational systems for aircraft or ships or both, which would increase safety and economy in both modes of transportation.

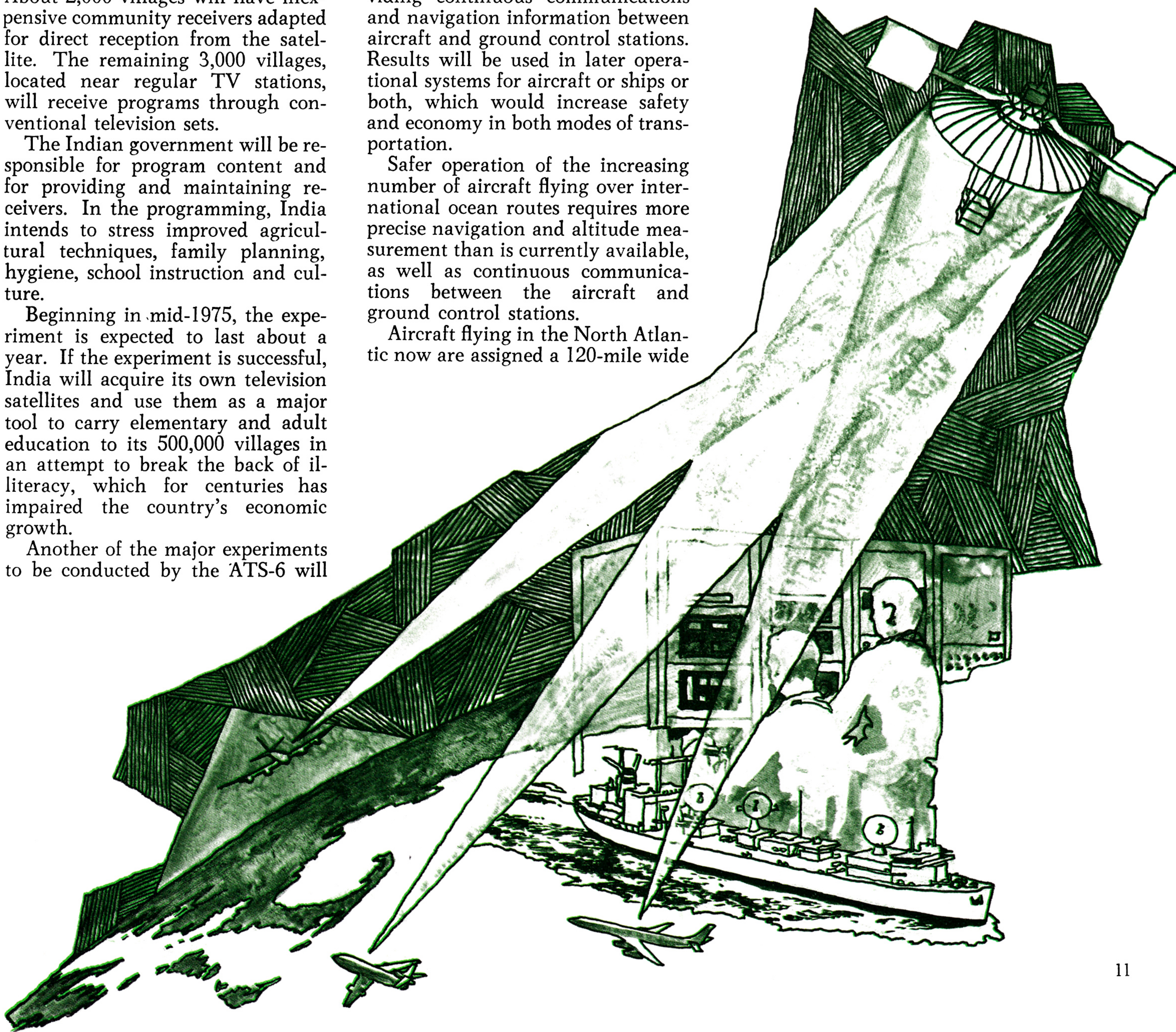
Safer operation of the increasing number of aircraft flying over international ocean routes requires more precise navigation and altitude measurement than is currently available, as well as continuous communications between the aircraft and ground control stations.

Aircraft flying in the North Atlantic now are assigned a 120-mile wide

flight corridor and are spaced at least 15 minutes apart. The goal of the PLACE experiment is to eventually allow each traffic lane to be narrowed to 30 miles with five minute spacing between aircraft.

Space technology resulting from the ATS-6 program will be demonstrably practical. In addition to widening communications horizons, the spacecraft will serve as a platform for many scientific experiments.

Some of the other experiments involve transmissions to and from other orbiting satellites, measurements of radio interference problems, studies of the effects of rainfall on millimeter wave frequency transmissions, and studies of solar cosmic rays, radiation effects on solar cells, and weather research. ■





# Space Medicine: Life Saving Spinoff





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*Medical techniques and equipment  
originally developed for space travel  
are saving and improving lives on earth.*

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**T**ECHNIQUES and equipment originally developed for the United States' space program are being used today to help save and improve the lives of people throughout the world.

Of all the important "spinoffs" generated by space exploration, the space-related advances of modern medicine are probably doing the most to be of direct benefit to mankind.

The files of the National Aeronautics and Space Administration (NASA), contain many examples of how today's medical techniques are being advanced by space technology.

Primarily because of advances in miniaturization and sophisticated electronics, the field of medicine has put more NASA-developed technology to use than perhaps any other discipline.

#### **Respiratory Diseases**

A compact, fully automatic gas analyzer is a good example of such technology.

The gas analyzer measures the composition of air breathed in and exhaled from the lungs as an aid in monitoring pulmonary and cardiovascular activity in patients.

Oxygen, carbon dioxide, nitrogen, and additional gases are measured simultaneously, on a breath-to-breath basis. It affords prompt information on human respiratory and metabolic functions, previously unavailable or too time consuming to obtain.

In hospital intensive care units, the instrument can be used to monitor the breathing of acutely ill patients, signaling the need for changes in therapy more efficiently than previous methods.

In surgeries, the anesthesiologist can monitor the patient's progress, checking inhaled concentrations of anesthetic gas.

#### **Quadriplegic Aids**

Patients who have lost use of their arms and legs are being aided by eye-operated switches, ultra-sensitive pressure devices, and devices operated by breath controls, which enable them to control environments in specially-equipped hospital rooms.

Pioneered at the Huntsville, Alabama Hospital, NASA-developed technology was used to equip a hospital room with various switches, controls, monitors and actuators needed for an environmental control system for handicapped persons.

Using the devices, an immobile patient can open and close doors and windows, control room temperature, change channels and control volume on a television set, change radio stations, dial a telephone, adjust the position of his bed, signal a nurse at a remote station, turn pages in a book, and perform various other tasks necessary for his comfort and convenience.

#### **Surgery**

A germ-control and dust-purging technique originally used in production of spacecraft is being used to help surgeons lower the risk of infection in surgical procedures.

The technique uses portable equipment designed for the continuous removal of dust and germs from the surgical area. Equipment includes helmets that resemble those worn by astronauts and specially treated surgical garments that bacteria cannot penetrate.

The concept is based on techniques developed by NASA and the aerospace industry for sterile spacecraft assembly and self-contained life support systems.

The equipment is used during surgical procedures—such as hip joint replacements—in which large incisions must remain open for several hours. Such surgery requires highly antiseptic conditions to protect the patient from infection.

#### **Eye Cataract Removal**

An instrument for eye surgery designed to simplify the removal of cataracts has been developed by NASA researchers working with an ophthalmologist.

The small, hand-held instrument uses a combination of high frequency vibrations with a small pumping mechanism to liquify and remove cataract and lens material. It has been tested successfully on animals.

At present, cataract surgery is a very delicate operation. It requires that a semi-circular incision be made over the lens of the eye. The incision is then stitched after the cataract and lens are removed. This procedure often takes up to an hour and patient convalescence lasts as long as six to eight weeks.

The new instrument makes only a small puncture in the eye and would minimize the problem of stitching in most cases. The instrument is about the size of an electric toothbrush and is small and light enough to be held in the hand. The tool can be manipulated easily by the surgeon during an operation.

#### **Congenital Heart Disorders**

NASA and Vanderbilt University have adapted a welding inspection system for use in rapid x-ray diagnosis of tumors and examination of cardiovascular flow. The inspection system—a real time neutron radiography unit—has been combined with image intensification, video data processing and display and kinescope photographic recording systems to be used in studies of children suffering from congenital heart disorders.

The system is designed to be used in visualizing the size of the heart defect and measuring the amount of blood flow through anomalous channels. The information gained is expected to help doctors determine which patients should have operations and at what age.

#### **Radio Pill**

NASA has developed a small radio transmitter pill which, when swallowed, can monitor deep body temperature by means of an FM receiver and associated electronics.

The miniaturized transmitter can detect very small variations in temperature in its passage through human alimentary tracts. Localized temperature rises may often



reveal the presence of infections or other disorders, aiding doctors in their diagnoses.

The pill has been used to monitor persons in an environment simulating travel in a spacecraft. The advantage of the device is that it allows monitoring of body temperature continuously over a 24-hour period on a day-by-day basis, a task difficult to accomplish by methods presently available.

The pill transmitter, about the size of a vitamin capsule, can be swallowed. It is coated so it will not dissolve while passing through the digestive tract. That trip usually takes a minimum of two days, but can be as long as one week if a low residue diet is prescribed. Its advantage is that it requires no wires attached to the body surface, nor does it require conventional inserted instrumentation such as oral or rectal thermometers or a thermistor probe.

Since the pill is small and uses a very small battery, it does not have the power to transmit signals for long distances. It is used most easily in situations where the subject is confined such as a hospital.

The pill transmitter also can be used to record and transmit other internal data in humans. The temperature sensing unit could be replaced by a monitor sensitive to stomach acidity, intestinal pressure, or to specific chemicals in the gastro-intestinal tract.

With continued technological advances in miniaturization, engineers are confident that as many as five factors can eventually be measured simultaneously by a device no bigger than an aspirin tablet.

#### Heart Disease

Doctors can watch a movie of the beating of a patient's diseased heart—identifying dead spots or scar tissue in the heart wall, aneurysms (bubble-like projections of the heart muscle) and other malfunctions—with a computer method devised by a NASA-Stanford University team.

The system is designed to improve on current complex diagnostic methods by providing a simple means of viewing the heart in action. Figuratively, it allows doctors to "walk around" the isolated beating heart, viewing it from any desired angle. They also can stop the display at any desired point of heart expansion or contraction and can play the picture back and forth for many cycles.

The system projects a three-dimensional animated cartoon-like image of any desired chamber of the patient's heart, in lines of light on a computer display

screen, similar to a television screen. The display is derived from two-dimensional "x-ray movies" made by injecting x-ray contrast dye into a desired heart chamber.

It appears that the method may be a major advance for the physician to determine the patient's need for heart surgery, coronary artery grafts, and treatment of various heart conditions. Heart disease is the leading cause of death in the U.S.

#### Heart Pacemakers

Aerospace technology originally developed for rechargeable nickel-cadmium cells for spacecraft power systems is being directly applied to a NASA supported effort by the Johns Hopkins Applied Physics Laboratory to produce a rechargeable cardiac pacemaker that would eliminate the present requirement for surgical replacement of such devices when their batteries are depleted.

Currently nearly 90 per cent of the pacemakers using conventional mercury batteries must be replaced every 24 months due to battery failure. The wearer of a rechargeable unit would simply recharge his unit by donning a special vest for several hours.

The power cell is essentially a miniature version of cells used in virtually all U.S. spacecraft.

#### Emergency Care

Flexible electrodes based on equipment developed by NASA have been designed as significant components of emergency coronary care units which could be used by cardiac patients or emergency attendants to send electrocardiographic data gathered by the kit to physicians by telephone.

After examining the relayed EKG data, the doctor could direct the patient or attendant to administer appropriate medication carried in the kit.

The adapted NASA electrodes are made of a conducting elastomer and shaped like golf balls. They can quickly be placed under the armpits of a heart attack patient to provide an artifact-free EKG signal that can be relayed by telephone.

Other advanced medical devices to come out of the space program include an electro-encephalograph helmet, an audiometric device to assist in diagnosing hearing defects in children, a powered prosthetic hand to help amputees, a portable light indicator for blind persons, an ear oximeter, a device which measures the blood's oxygen content by noting red and infrared light absorption in blood circulating through the ear, a sleep analyzer, and many others. ■

- (1) Space age technology decontaminates breathing machines used by asthma, emphysema and other respiratory disease sufferers. (2) An oximeter used by doctors to determine blood pressure. (3) Eye-operated switches, breath control devices and ultra-sensitive pressure devices aid paralyzed patients. (4) Radio transmitter pill to monitor deep body temperatures. (5) Ambulance attendant uses space instrumentation to transmit a patient's electrocardiogram to hospital. (6) Cardiac monitoring station. (7) Long-lived heart pacer can be surgically implanted for up to 20 years. (8) Ill baby is equipped with sensor and transmitter which sounds alarm if she experiences breathing difficulty. (9) Respiratory helmet measures child's oxygen consumption. (10) Scientists examine new bacteria collector developed as space spinoff.

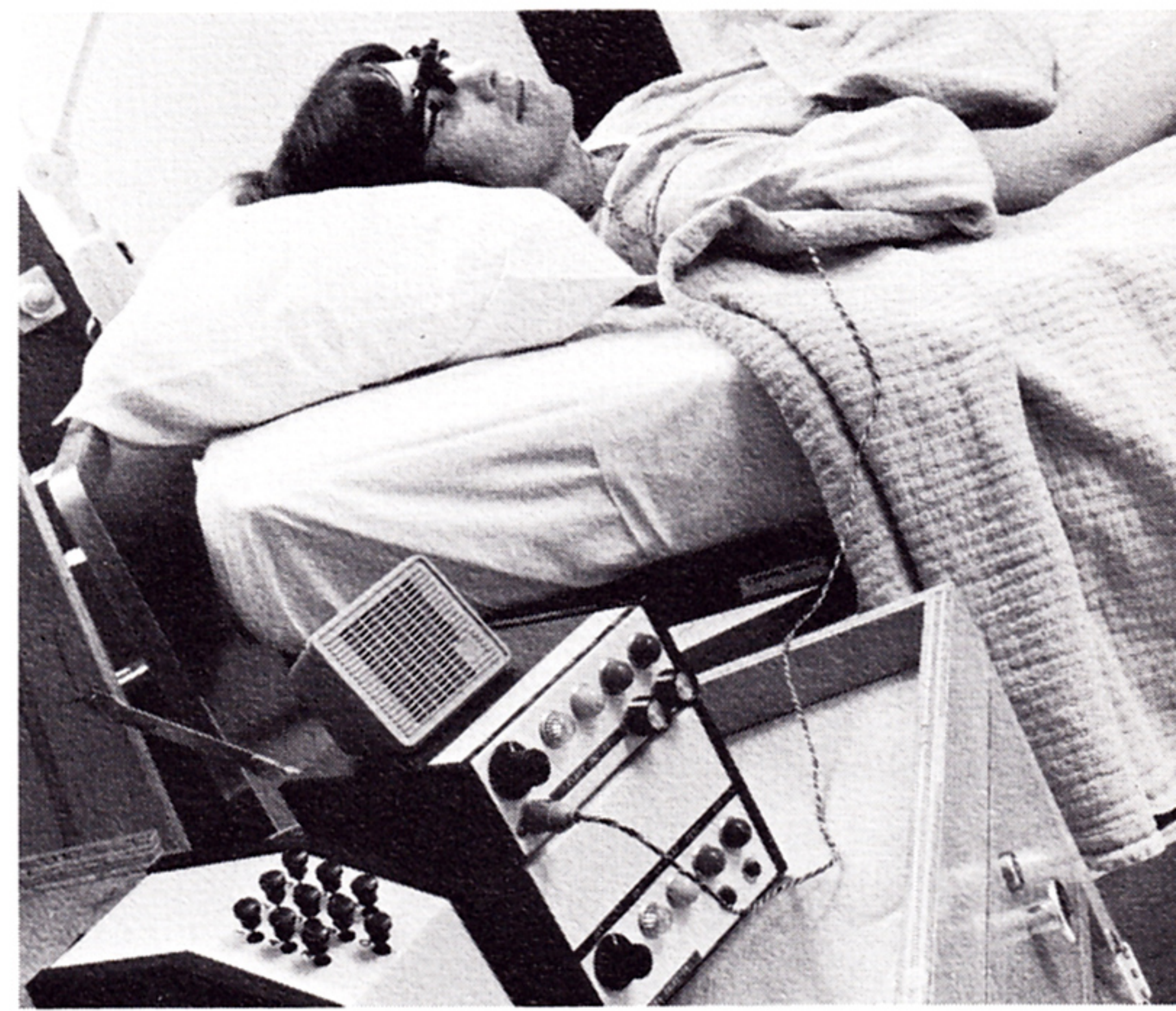




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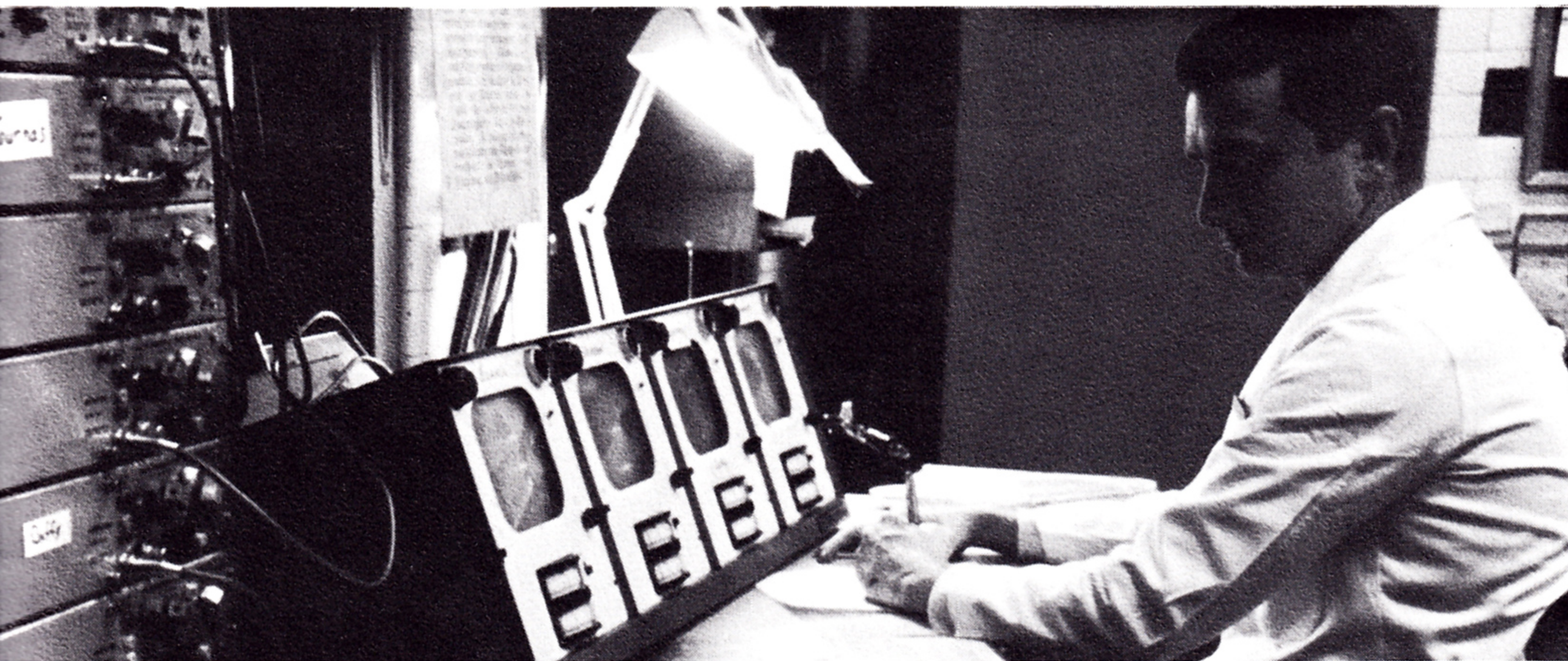
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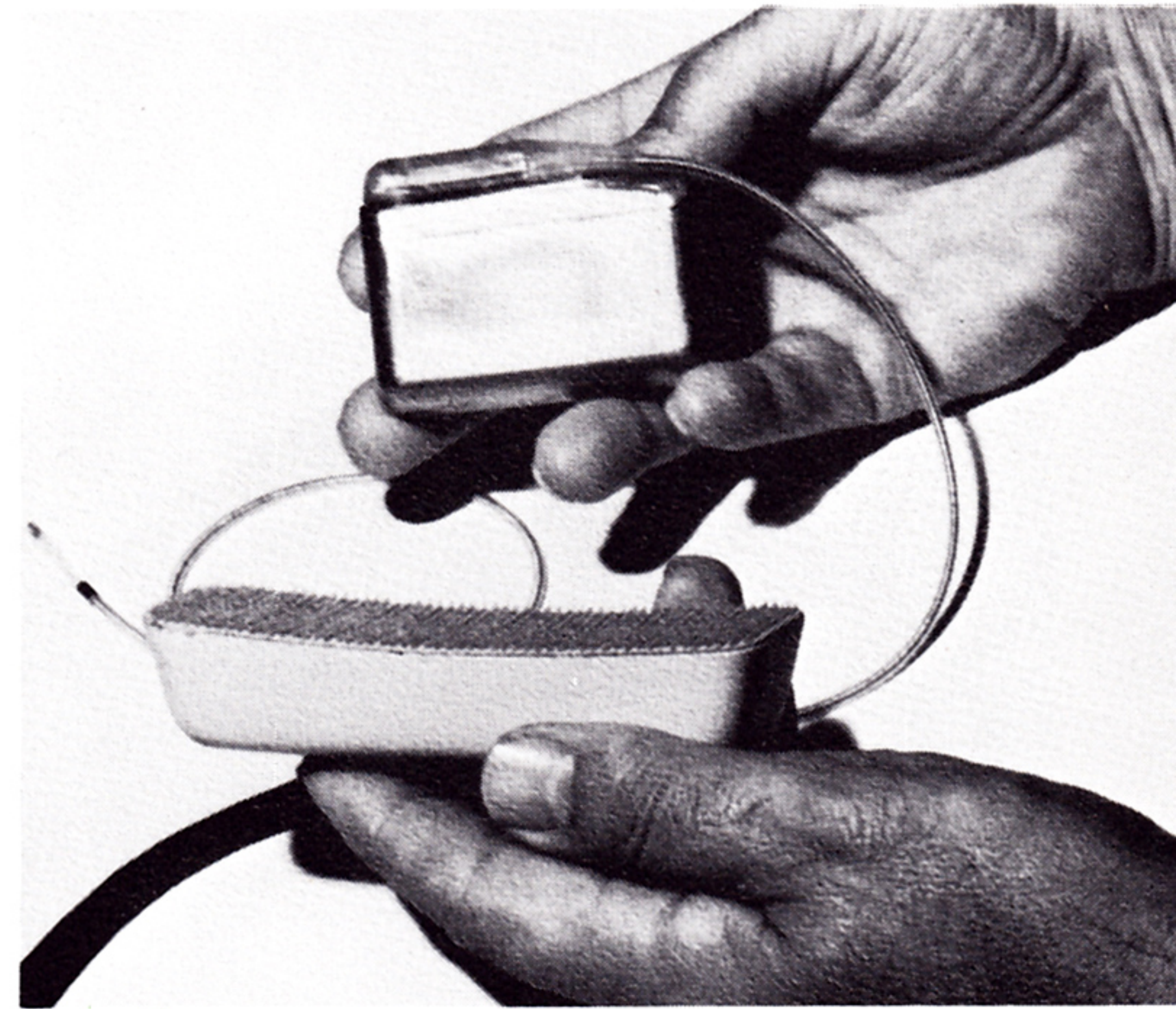
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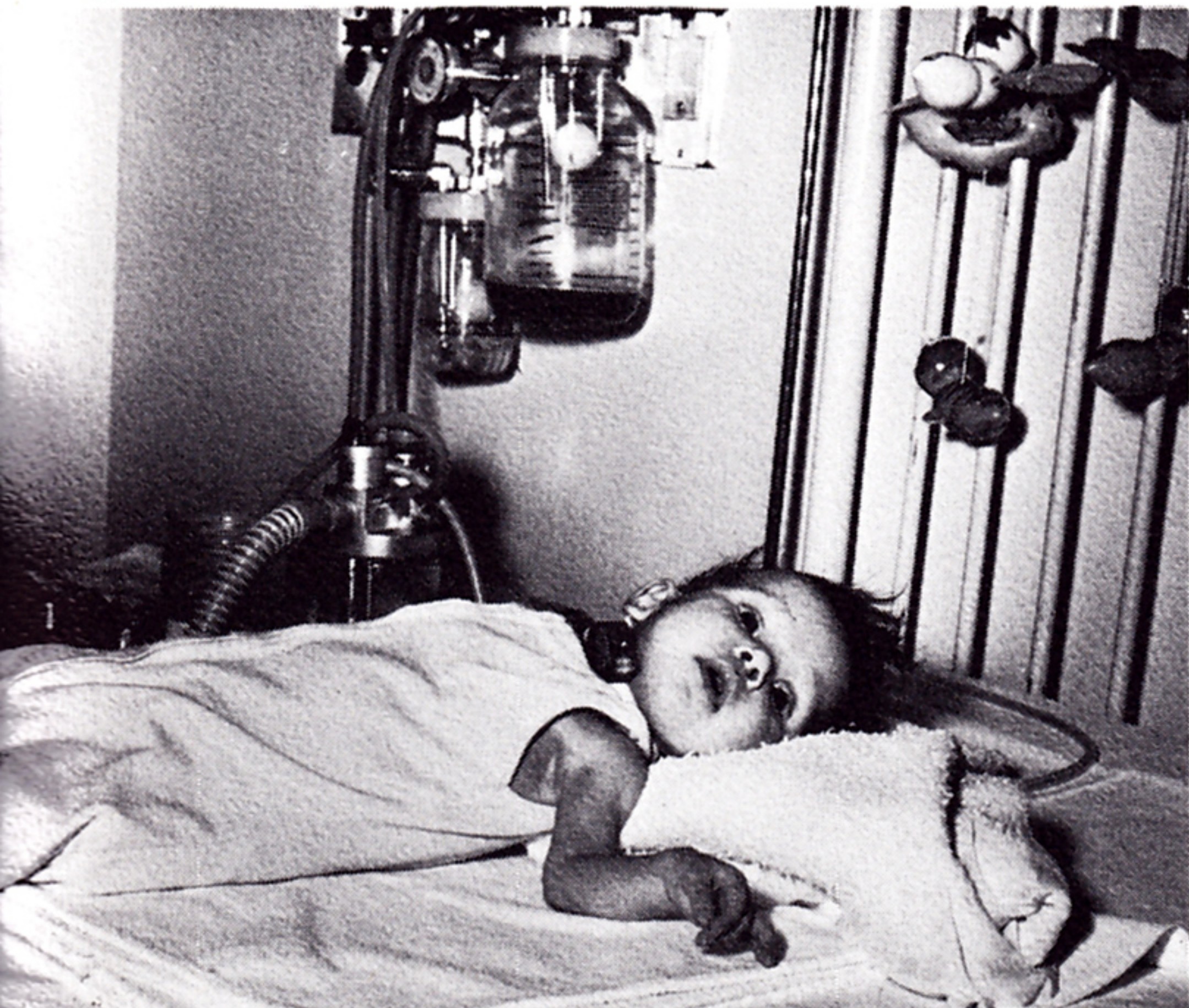
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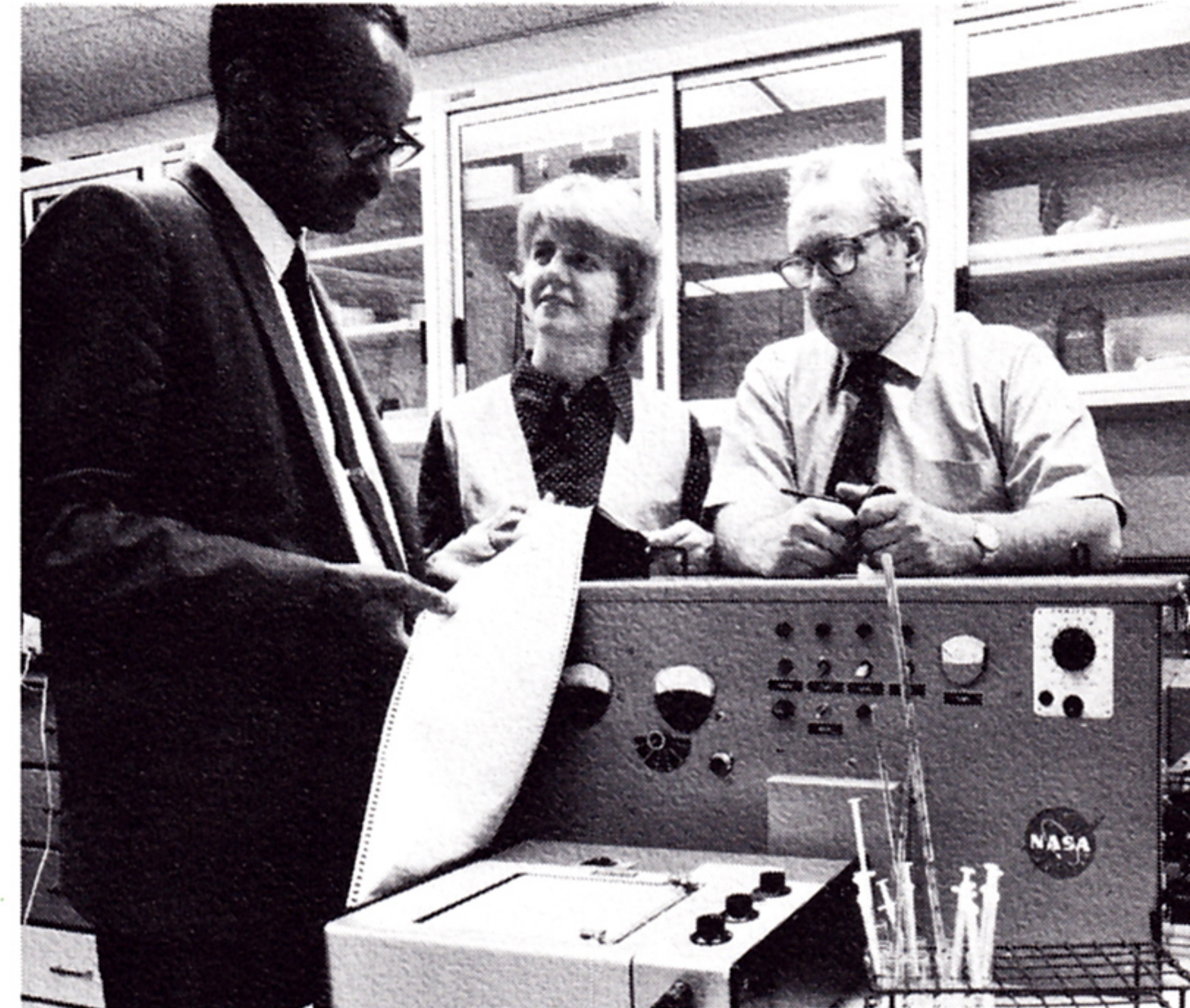
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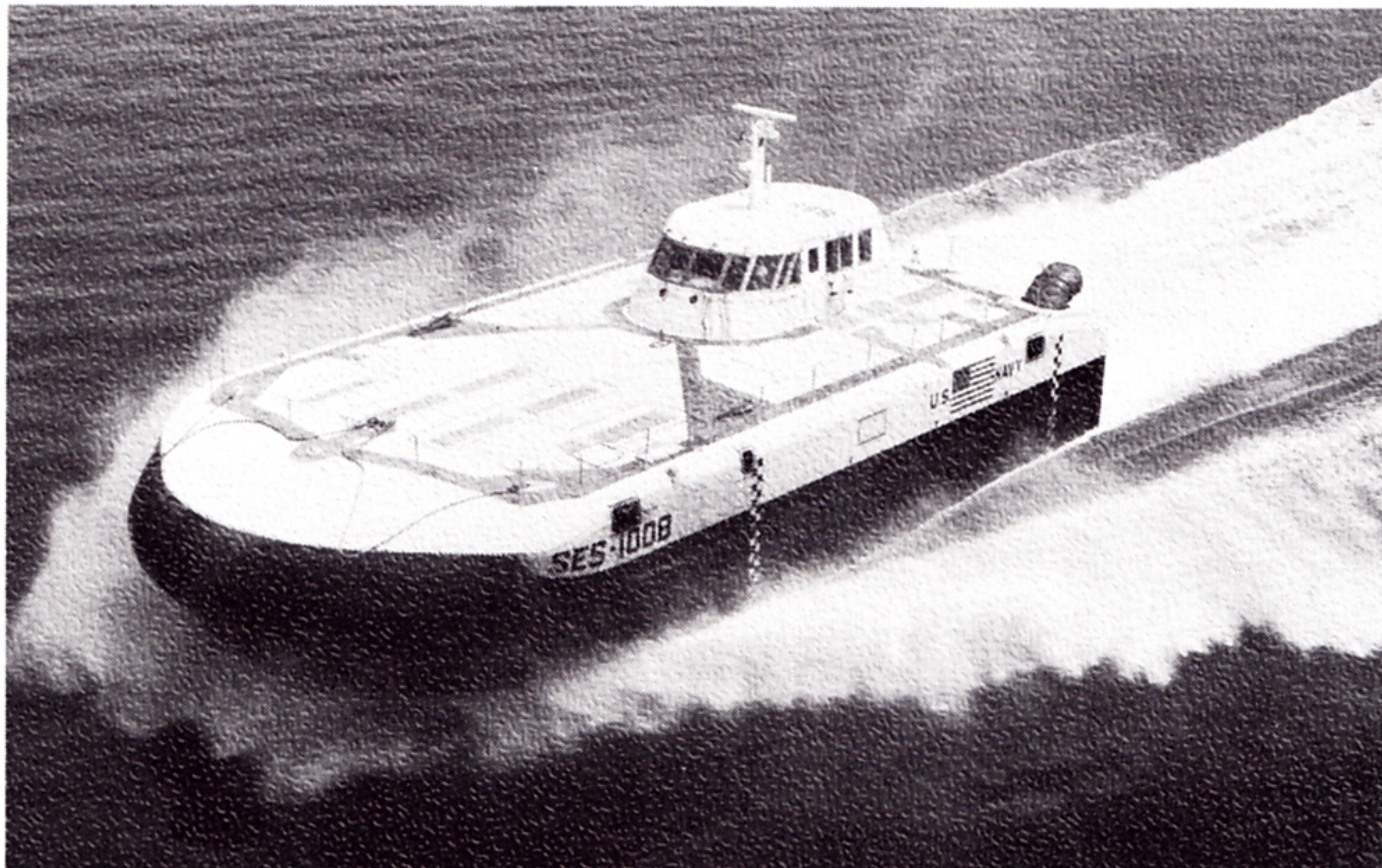


# News Digest

**THE U. S. NAVY'S SES-100B SURFACE EFFECT SHIP** test craft achieved a speed in excess of 80 knots (more than 92 miles per hour)—a world record for craft that ride on a captured air bubble.

Textron's Bell Aerospace Operations, New Orleans, Louisiana, which developed and now is testing the 100-ton propeller-driven, air-supported craft for the Naval Materiel Command's Surface Effect Ship Project Office (PM-17) set the world speed record for this type craft during a test mission at Panama City, Florida.

The record speed was accomplished during tests on an instrumented range and the speed was recorded by highly-precise tracking radar operated by U. S. Navy personnel.



The crew described the craft's stability as "excellent" and said they had a smooth ride throughout the high-speed operation. Bell Aerospace engineers reported that the craft performed flawlessly. They said the speed achieved was extremely close to predictions based upon analysis and model test data.

The record speed run followed the successful completion of testing necessary to confirm the technology for the design of a 2,000-ton ocean-going Surface Effect Ship. During missions in the Gulf of Mexico, the SES-100B has operated for considerable periods of time in high sea states, and has repeatedly demonstrated performance, stability and habitability exceeding expectations.

The extensive technical data being generated by the heavily-instrumented SES-100B is being used by the Navy and Bell Aerospace to validate the predictions and design features to be incorporated into larger Surface Effect Ships in the 2,000-ton class.

## **WILL MEN EVER RETURN** to the moon?

Dr. James C. Fletcher, Administrator of the National Aeronautics and Space Administration says it is quite possible the Russians will send men there for short stays during the 1970s.

"Whether we will want to send men back to the moon on short Apollo-type missions requires further study. It is probably better to wait until we are ready to begin establishment of manned scientific bases for long term use, like our present bases in the Antarctic," Fletcher says.

Such scientific bases on the moon are not likely "unless they are built in international projects with the cooperation of the Soviet Union, the United States and perhaps even Europe. Such bases would be too expensive for one country alone," Fletcher told the National Space Club.

NASA is considering eight unmanned moon missions between 1979 and 1991.

These missions include:

- ☐ A Lunar polar orbiter in 1979.
- ☐ Two other lunar orbiters in the 1980s.
- ☐ Two lunar rovers in the 1980s that would travel as far as 60 miles during a year on the moon.
- ☐ A "Lunar Halo Satellite" which would assure communications with the hidden side of the moon.
- ☐ Two lunar rovers which could return samples to Earth from any point on the moon. To date no samples have been returned from the hidden side of the moon.

**A \$2.2 MILLION AUTOMATIC** aircraft landing system—the AN/SPN-42-T3—has been delivered to the U.S. Navy's Whidbey Island Naval Air Station near Seattle. The Bell Aerospace system, which permits pilots to make "hands off" landings in many types of weather, is a land-based version of Bell's AN/SPN-42 automatic landing system currently in operation aboard nine Navy aircraft carriers.

The Whidbey Island installation is the second land-based version of the AN/SPN-42 system. For the past two years a similar system has been in operation at the Navy's Cecil Field Air Station, near Jacksonville, Florida.

**BELL AEROSPACE'S MINIATURE ELECTROSTATIC** Accelerometer (MESA) is conducting one of 14 scientific experiments on board NASA's Atmosphere Explorer satellite. MESA, which senses minute changes in acceleration, is being used to measure tiny fluctuations in atmospheric density in the Thermosphere—a little-known region of the upper atmosphere.

Scientists believe the experiments will increase understanding of the Thermosphere's complex physical and chemical processes and will ultimately lead to better understanding of how they affect weather environment and health on earth.

Bell development of the MESA dates back to 1959. Between 1966 and 1971 MESA was used in various applications including several Air Force studies of air density and drag in the upper atmosphere. Future applications include several Air Force satellite launches scheduled in 1974 and 1975.



# Here Comes the **VIKING**

*Production of Bell Aerospace Canada's first Viking air cushion vehicle has been completed at Grand Bend, Ontario.*

*Like its larger sister, the Voyager, the Viking is fully amphibious and capable of operating over a full range of surfaces from water to land, mud, ice and snow.*

*The versatile and quick-reacting Viking is designed for Coast Guard search and rescue work, commercial exploration for fuels and minerals, and other applications. The 11-ton vehicle can carry a 5-ton payload.*

*In its search and rescue role, Viking can cruise for 13 hours, powered by its Twin-Pac ST6T-75 marine gas turbine engine with a 1,450 Imperial gallon fuel capacity. It burns a variety of fuels, including kerosene, JP4, JP5, JETA, AVTUR, and arctic diesel fuel.*

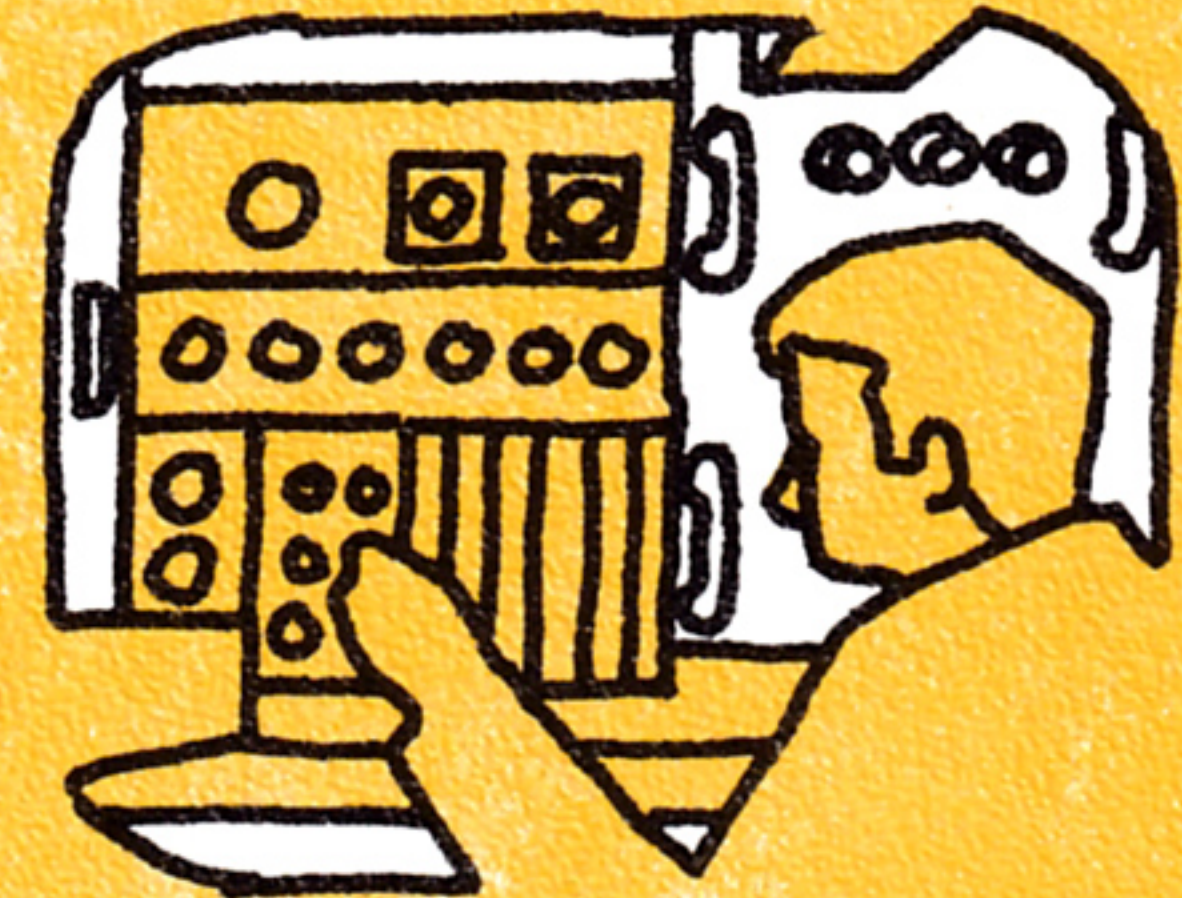
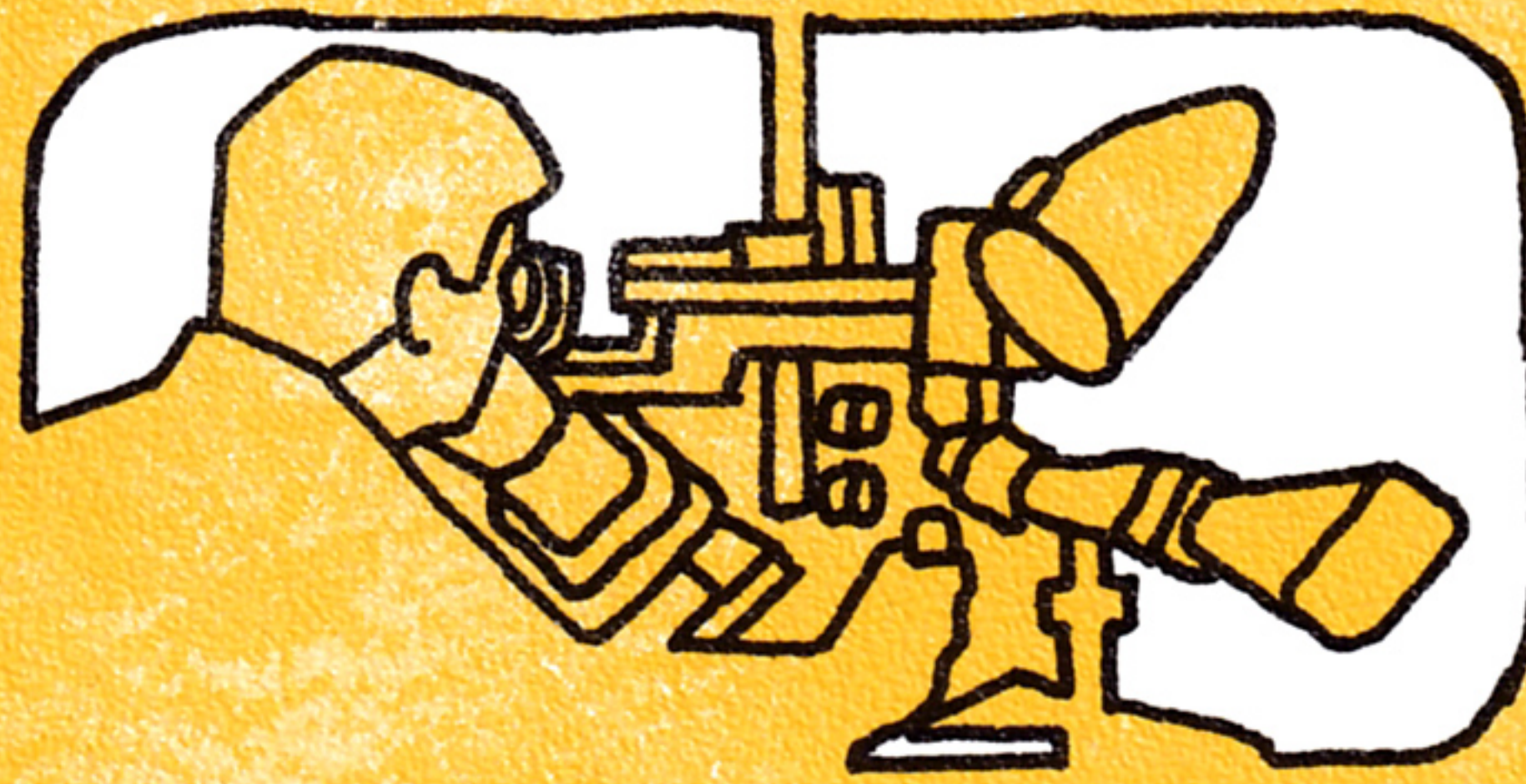
*Many of Viking's components are interchangeable with Voyager, 45-ton Bell craft that have been in service since 1971.*

*Both craft are built of bolt-together modules which allow them to be disassembled easily for shipment by air, rail or truck.*

*Part of the estimated \$2 million development cost of Viking 001 is being funded under a Program for Advancement of Industrial Technology (PAIT) agreement with the Canadian Department of Industry, Trade and Commerce.*







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